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DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DEPARTMENT OF THE AIR FORCE MANUAL

*(Includes
Change 2)*

PASTRY BAKING

UNIVERSITY OF CALIFORNIA
LOS ANGELES
DEC 29 1966

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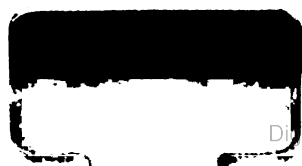
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DEPARTMENTS OF THE ARMY AND THE AIR FORCE

OCTOBER 1966

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TECHNICAL MANUAL
No. 10-411
AIR FORCE MANUAL
No. 146-11

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON, D.C., 11 October 1966

PASTRY BAKING

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* This manual supersedes TM 10-411/AFM 146-11, 8 August 1962, including C 2, 1 February 1965.

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PART ONE

PASTRY BAKING OPERATIONS

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Purpose and Scope

a. The purpose of this manual is to assist Army and Air Force personnel engaged in the production of the baked pastry component of the ration. Methods and procedures presented in this text are applicable to pastry baking in garrison messes and central pastry kitchens, and may be adapted for use in the field.

b. Appendix I is a list of pertinent references. Information applicable to several areas of this manual is contained in appendixes II through IX.

2. Recommended Changes

Users of this manual are encouraged to sub-

mit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to the Commandant, U.S. Army Quartermaster School, Fort Lee, Va., 23801.

3. Responsibility for Pastry Items

Pastry items are produced in the central pastry kitchen at installations where central pastry kitchens are authorized. At installations which do not have central pastry kitchens, pastry items are prepared by the cooks in the various messes.

Section II. CENTRAL PASTRY KITCHEN

4. Establishment

The establishment of a central pastry kitchen may be authorized at an installation having a field ration strength of 2,500 or more; at an installation where mess kitchens lack the functional space or the facilities to produce pastry items of the quality or in the quantity desired; at an installation where a centralized mess unit is organized to provide combined mess supervision for a service unit, group, regiment, or service-type installation (such as a staging area, port terminal, or redistribution center); or at an installation, such as a disciplinary bar-

racks, where a requirement exists to provide vocational training or rehabilitation. The central pastry kitchen is a fixed facility and is an adjunct of all the messes it services. At Army installations, the need for the establishment of a central pastry kitchen or for the expansion of existing facilities is determined by the appropriate major commander or by a qualified representative of the U.S. Army Food Service Center. At Air Force installations, this determination is made by the base commander.

a. *Buildings.* Central pastry kitchens are

planned so as to provide for the functional arrangement of equipment and utilities and for adequate work space. Production begins in the ingredient room and ends at the loading platform; straight-line production is emphasized throughout.

(1) *Army buildings.* The Chief of Engineers is responsible for the preparation of standard plans for the construction of new buildings to house central pastry kitchens. These plans are coordinated with the U.S. Army Food Service Center. When an existing building is to be altered for use as a central pastry kitchen, current standard plans must be used as a guide so far as practicable. If it is necessary to deviate from standard plans, approval must be obtained from proper authority as directed in AR 30-55.

(2) *Air Force buildings.* Information on the construction of new Air Force buildings is contained in AFM 88-2 and AFM 88-15. Requests for standard Air Force plans should be forwarded to HQ USAF (AFOCE), Wash., D.C., 20333. Procedures for modifying existing buildings are contained in AFM 146-1.

b. Equipment. The machinery, equipment, and accessories authorized for use in Army central pastry kitchens are listed in TA 50-911. Requisitions for unauthorized items and items in excess of authorized allowances should be processed in accordance with AR 725-50. The machinery, equipment, and accessories authorized for use in Air Force central pastry kitchens are listed in TA 504. All standardized or type-classified pieces of equipment must conform to specifications developed by the activity having logistical responsibility for the items.

5. Types

The type of central pastry kitchen established is determined by the troop strength of the installation. Table 1 lists the four types of Army central pastry kitchens and their respective capacities. For types and capacities of Air Force central pastry kitchens, see TA 504.

Table 1. Army Central Pastry Kitchen Types and Capacities

Type	Capacity (servings) per 8 hours of operation	
	a	b
BA-7	1,500	3,000
BA-6	3,000	6,000
BA-5	7,000	14,000
BA-3	11,000	22,000

Note. Column a indicates number of men served when 2 pastries per man per day are produced. Column b indicates number of men served when 1 pastry per man per day is produced.

6. Supervision

The installation commander, through the installation quartermaster or director of supply (Army), or through the food service officer (Air Force), is responsible for supervision of the central pastry kitchen and all operations incident thereto, including proper staffing, efficient operation, equitable distribution of baked items to field ration messes, coordination of the installation menu and central pastry kitchen operations, and the proper training of unit personnel in pastry baking procedures.

7. Operational Practices and Procedures

a. Starting Operations. Before a central pastry kitchen can begin full-scale production, personnel must be trained and equipment must be checked. The installation commander, through the food adviser, selects a limited number of company-type field messes for which pastry will be prepared during preliminary baking operations. Full-scale production begins as soon as possible.

b. Limitation on Preparation of Cream Fillings. AR 40-5 prescribes that foods which readily support bacterial growth, such as locally prepared cream fillings, cream sauces, custards, etc., will in no instance be prepared more than 3 hours before serving and always as near to serving time as possible. In compliance with this regulation, the central pastry kitchen bakes pie shells for cream pies and layer cakes for cream-filled type cakes and delivers them to messes; the messes must prepare the cream fillings and complete the production of these pastry products as near to serving time as possible.

c. Packing and Storage. All finished products prepared in the central pastry kitchen

must be carefully packed in approved delivery cabinets and properly stacked or stored close to the loading platform in preparation for delivery to the messes.

d. Delivery. A suitable delivery truck, preferably one with panel-type body, should be furnished the central pastry kitchen for delivery of baked pastries to the messes. Empty delivery cabinets, sheet pans, and metal pie plates must be picked up by the deliveryman whenever deliveries of newly baked items are made. Mess personnel are responsible for cleaning the cabinets and pans before they are returned to the central pastry kitchen.

e. Use of Paper Pie Plates. Paper pie plates may be used in central pastry kitchens so that the problems of issue, return, and proper cleaning of the pie tins will be avoided. Paper pie plates, 9 inches in diameter and $1\frac{1}{4}$ inches deep, may be obtained through normal supply channels (FSN 7330-641-4952). These pie plates are lined with glassine and have metal rims.

f. Disposition of Radioactive Bakery Products. Baked pastries that have been contaminated by radioactive particles are not salvageable and must be disposed of in accordance with medical regulations.

g. Closing Operations. When the field ration strength of an installation drops below the minimum required for central pastry kitchen operations or when the installation is scheduled for deactivation, all central pastry kitchen equipment will be processed in accordance with AR 210-17 or AFM 67-1.

8. Sale of Pastry Products

a. Army. No pastry products made from Army-owned ingredients will be used for sale or personal gain or for any purpose other than feeding personnel authorized to subsist on the field ration.

b. Air Force. Information on the sale of pastry produced in appropriated fund baking facilities of the Air Force is contained in AFM 146-1.

CHAPTER 2

OPERATIONS

Section I. OPERATING PERSONNEL

9. Garrison Mess Personnel

Staffing guides list no pastry cooks for unit and consolidated messes; however, trained cooks that are assigned to the mess have received instruction in the principles of pastry baking and are capable of preparing the pastry components of the ration.

10. Central Pastry Kitchen Personnel

a. *General.* The troop strength of the instal-

lation and the type and size of the facility are the factors used primarily to determine the number of personnel required to operate a central pastry kitchen efficiently. Civilian operating personnel may be used in Army and Air Force central pastry kitchens in accordance with departmental staffing guides. Table 2 lists the personnel required for each shift in each type of Army central pastry kitchen. Staffing guides for Air Force central pastry kitchens will be found in AFM 26-3.

Table 2. Personnel Required for Each Shift in Each Type of Army Central Pastry Kitchen

Descriptive titles	MOS	Grade	BA-7	BA-6	BA-5	BA-3
Chief pastry baker -----	94B40	E-7				1
Chief pastry baker -----	94B40	E-6	1	1	1	
Shift leader -----	94B40	E-5	-(1)	-(1)	1(1)	1(1)
Mixer -----	94E20	E-4	1(1)	1(1)	1(1)	2(2)
Mixer helper -----	94A10	E-3	1(1)	1(1)	1(1)	2(2)
Benchman -----	94E20	E-4	2(2)	3(3)	4(4)	5(5)
Bench helper -----	94A10	E-3	2(2)	3(3)	4(4)	5(5)
Ovenman -----	94E20	E-4	1(1)	2(2)	2(2)	3(3)
Oven helper -----	94A10	E-2	1(1)	2(2)	2(2)	3(3)
Stockroom clerk -----	94A10	E-2	-	-	-	1
Issue clerk -----	76A10	E-3	1	1	1	1
Deliveryman -----	94A10	E-3	1	1	1	1
Assigned total -----			11 (9)	15 (13)	18 (15)	25 (21)
On-the-job trainees:						
Cooks -----			4 (4)	6 (6)	8 (8)	8 (8)

Note. Figures in parentheses indicate number of personnel required each day for each additional shift after the first.

b. *Duties.* Duties of personnel include, but are not limited to, those listed below.

(1) *Pastry bakery officer.* At some installations supervision of the central pastry kitchen is the full-time duty of a commissioned officer. When a pastry bakery officer is authorized, he has the responsibility for all of the various activities related to the operation of the central pastry kitchen, including the requisitioning of raw ingredients, the preparation of pastry items, the sanitary storage of finished

products, and the issue of finished products to the messes.

(2) *Chief baker.* The chief baker, who is responsible for all operations of the bakery, must be thoroughly skilled in all phases of pastry baking. He advises and guides foremen in the most efficient operational procedures. He computes the number of mixes or batches to be baked and selects formulas for items to be produced for installation menu requirements. He maintains or directs the maintenance

of all necessary forms and records pertaining to the receipt, storage, and issue of ingredients, supplies, and baked items. He makes out the duty assignments for all personnel under his supervision to insure that on-the-job trainees are rotated in all shop positions. He helps in the production line during periods of abnormally high production and performs various functions in the absence of regularly assigned personnel. He enforces regulations concerning safety, sanitation, and the proper use and maintenance of equipment. When no pastry baker officer is assigned, the chief baker assumes the officer's duties.

(3) *Shift leader.* The shift leader is responsible to the chief baker for the supervision of the personnel on his shift, for the maintenance of work schedules, for adherence to formulas, and for the maximum use of all ingredients and mixes. He assists in the makeup of all baked items and performs other duties assigned by the chief baker.

(4) *Mixer.* The mixer must be a skilled pastry baker capable of properly blending and mixing the batters, doughs, and finishing materials called for in the day's production schedule. He is responsible for checking the quality and quantity of ingredients before mixing; for checking equipment before starting operations; for adhering to correct mixing times, temperatures, and procedures as specified in the formulas; for maintaining yeast-raised doughs until they are properly fermented; for the timely and progressive preparation of pie and cake fillings and frostings; for maintaining schedules that fix the time that doughs and batters are due at the makeup bench; for keeping his equipment clean; and for performing operator's maintenance on the equipment used in mixing doughs and batters.

(5) *Mixer helper.* The mixer helper is

responsible for weighing all of the ingredients used each day. He must carefully weigh the ingredients of each formula and assist the mixer in mixing the doughs and batters. He is responsible for keeping all containers and bins filled with the proper ingredients for the day's requirements.

(6) *Benchman.* The benchman is responsible for preparing pans for use in baking, for weighing and shaping doughs, for weighing batters, and for placing the doughs and batters in the pans. He also assists in the icing and finishing of baked products.

(7) *Bench Helper.* The bench helper assists the benchman in preparing pans, in weighing doughs and batters, in shaping doughs, and in panning doughs and batters. He also assists in washing the pans used in baking.

(8) *Ovenman.* The ovenman is responsible for baking all items produced each day. He starts the ovens, maintains proper oven temperatures as designated in formulas, determines when yeast-raised items are properly proofed, loads ovens and insures that oven space is being used properly, unloads ovens when products are properly baked, and cools baked items properly. He is responsible for seeing that the pans used in baking are clean and for keeping the ovens and the floor around the ovens clean.

(9) *Oven helper.* The oven helper assists the ovenman in starting the ovens and in loading and unloading the ovens. He assists in washing the pans used in baking and keeps the ovens and the floor around the ovens clean.

(10) *Stockroom clerk.* The stockroom clerk is responsible for the tally-in and tally-out of all ingredients issued to the central pastry kitchen by the commissary. He posts DD Form 157 (Central Pastry Kitchen Production Record and Summary of Stores) daily. He is responsible for the proper storage of ingredients and for the sanitation

and policing of the stockroom. He insures that highly perishable items, such as frozen eggs and frozen fruits, are received from cold storage in sufficient time to be properly conditioned for use. In the absence of the stockroom clerk or when a stockroom clerk is not authorized, the issue clerk assumes his duties.

- (11) *Issue clerk.* The issue clerk is responsible for the issue of finished products to the messes. He keeps records of all deliveries; he supervises the deliveryman and instructs him in the proper care and handling of all baked items. He is responsible for all pastry cabinets and baking pans. He must enforce rigid standards of cleanliness during handling and delivery of baked products. He assumes the duties of the stockroom clerk when the stockroom clerk is absent or when one is not authorized.
- (12) *Deliveryman.* The deliveryman is directly responsible to the issue clerk and must follow his instructions in the careful handling and delivery of baked items to the messes. It is the deliveryman's responsibility to keep the delivery truck clean at all times. He must be sure that cabinets and pans from previous deliveries are collected from the messes whenever delivery of newly baked items is made. He is responsible for stacking cabinets in the bakery in preparation for the next delivery.

11. Training Program

a. An on-the-job training program for unit mess personnel is necessary if these men are to become qualified as pastry bakers. This program provides experience in solving pastry production problems and provides training in

the planning and supervision of economical and efficient unit mess pastry baking operations. Thorough training of assigned personnel in the various phases of pastry baking is the responsibility of the officer in charge. Personnel of all messes who may accompany units on separate or detached service should be trained and experienced in the techniques of pastry production.

b. The use of a central pastry kitchen as a facility for training personnel must not be overlooked. Whenever practicable, students attending local food service schools should be attached to central pastry kitchens for training in mass production of pastry items. Officers having charge of, or taking courses in, mess management or supervision should be attached to the pastry kitchen so that they will become familiar with the procedures involved in pastry baking. The installation food adviser, acting for the quartermaster/S-4 or director of supply, should coordinate with the S-1 (G-1) in the selection and rotation of unit mess personnel to receive on-the-job training. On-the-job trainees should be detailed for a minimum of 60 days on an attached basis and should not be considered a part of, nor cause for reduction in, the number of personnel assigned. The total number of unit mess personnel to receive on-the-job training each period must be in accordance with table 2. One-half of the number of trainees should be detailed to the central pastry kitchen every 30 days in order to provide at all times an overlap of personnel with practical knowledge of daily operations. All phases of training within the facility should be under the supervision of assigned skilled personnel and should include actual demonstrations of correct techniques and methods employed. As trainees acquire experience and skill, they should be assigned progressively to more difficult and responsible duties until they become thoroughly acquainted with every phase of pastry baking.

Section II. MACHINERY AND EQUIPMENT

12. General

Each piece of equipment is designed to perform a definite function and will enable the baker to make the best possible product with

the least effort. Because there is a shortage of properly trained men in the baking field, labor-saving equipment becomes doubly important; the breakdown of one piece of equipment

can seriously affect the quality and quantity of the baked goods. Personnel must know how to operate and care for the equipment they use in the manner prescribed in the appropriate technical manual or manufacturers' instructions. The skilled baker will recognize faulty operation and report it immediately for repair. Careless operation, including failure to keep the machinery clean and properly lubricated, leads to premature deterioration and breakdown of equipment. Preventive maintenance is necessary to the continued operation of the pastry baking facility.

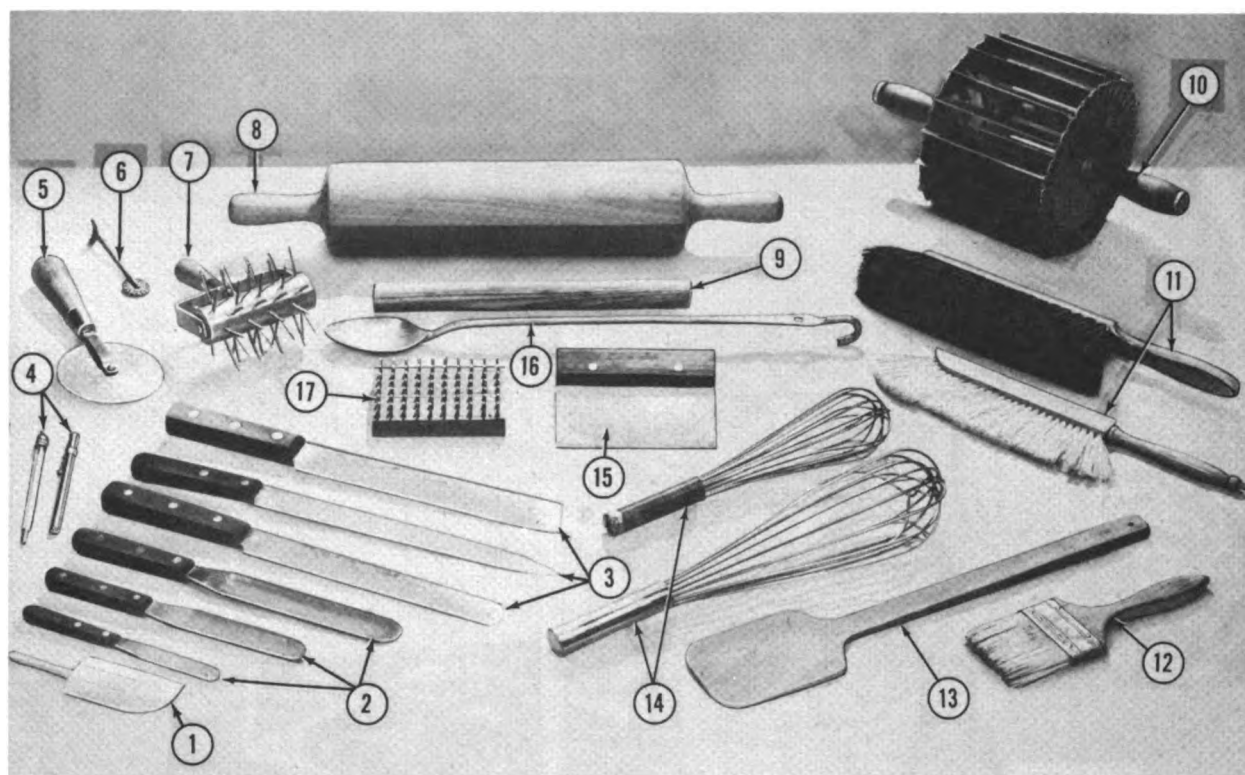
a. Garrison Mess Equipment. The operation, care, and maintenance of the equipment used for pastry production in the Army mess is covered in TM 10-415; Air Force equipment is covered in AFM 146-8 and TO 41B-1-141 CAF.

b. Central Pastry Kitchen Equipment. Vertical mixers, steam kettles, refrigerators, and cabinet and sectional-type ovens are covered in TM 10-415 and AFM 146-5. TM 10-410 and manufacturers' manuals cover operation, care, and maintenance of proofing cabinets, reel and rotary ovens, and other heavy equipment used in the production of yeast-raised items.

13. Handtools

The handtools used in baking are shown in figure 1. Some instructions for the proper cleaning and storage of these items are given below.

a. Wash wooden utensils with warm soapy water, rinse with clear hot water, and dry thoroughly. Do not soak rolling pins, wooden-handled knives, or other wooden utensils in water. Soaking will cause the wood to expand; and as



- | | | |
|------------------------|--------------------------------|------------------------|
| 1 Rubber bowl scraper | 7 Docker | 13 Wooden paddle |
| 2 Spatulas | 8 Large rolling pin | 14 Wire hand whips |
| 3 Knives | 9 Small rolling pin | 15 Dough scraper |
| 4 Thermometer and case | 10 Bun divider (squirrel cage) | 16 Long-handled spoon |
| 5 Pastry wheel | 11 Bench brushes | 17 Docker (improvised) |
| 6 Pie jagger | 12 Pastry brush | |

Figure 1. Handtools.

the wood dries, it will contract. The expansion and subsequent contraction of the wood will cause it to deteriorate.

b. Wash other handtools thoroughly with hot water and soap or detergent; rinse with clear hot water and air-dry.

c. Store utensils and tools in a dry place; do not stack.

14. Baking Pans

The sheet pans, layer cake pans, pie tins, and muffin tins used in baking are shown in pertinent sections of this manual. Clean baking pans thoroughly after each use so that there is no trace of pan grease or food left in the pans. Wash the pans with hot water and soap

or detergent, rinse with clear hot water, and air-dry. Store pans in a dry place, bottoms up, and do not stack.

15. Electric Sifter

An electric sifter (fig. 2) is used in the central pastry kitchen for sifting and blending flour and other dry ingredients for bread and pastry products. Sifting is done by the movement of an oscillating cradle over a screen; the sifted flour falls by gravity into a container or small mixer.

a. *Operation.* Plug the cord into an outlet and start the motor by using the switch located in the terminal box. Make sure that a container large enough to hold the flour is placed under the chute and that the chute door is in a raised

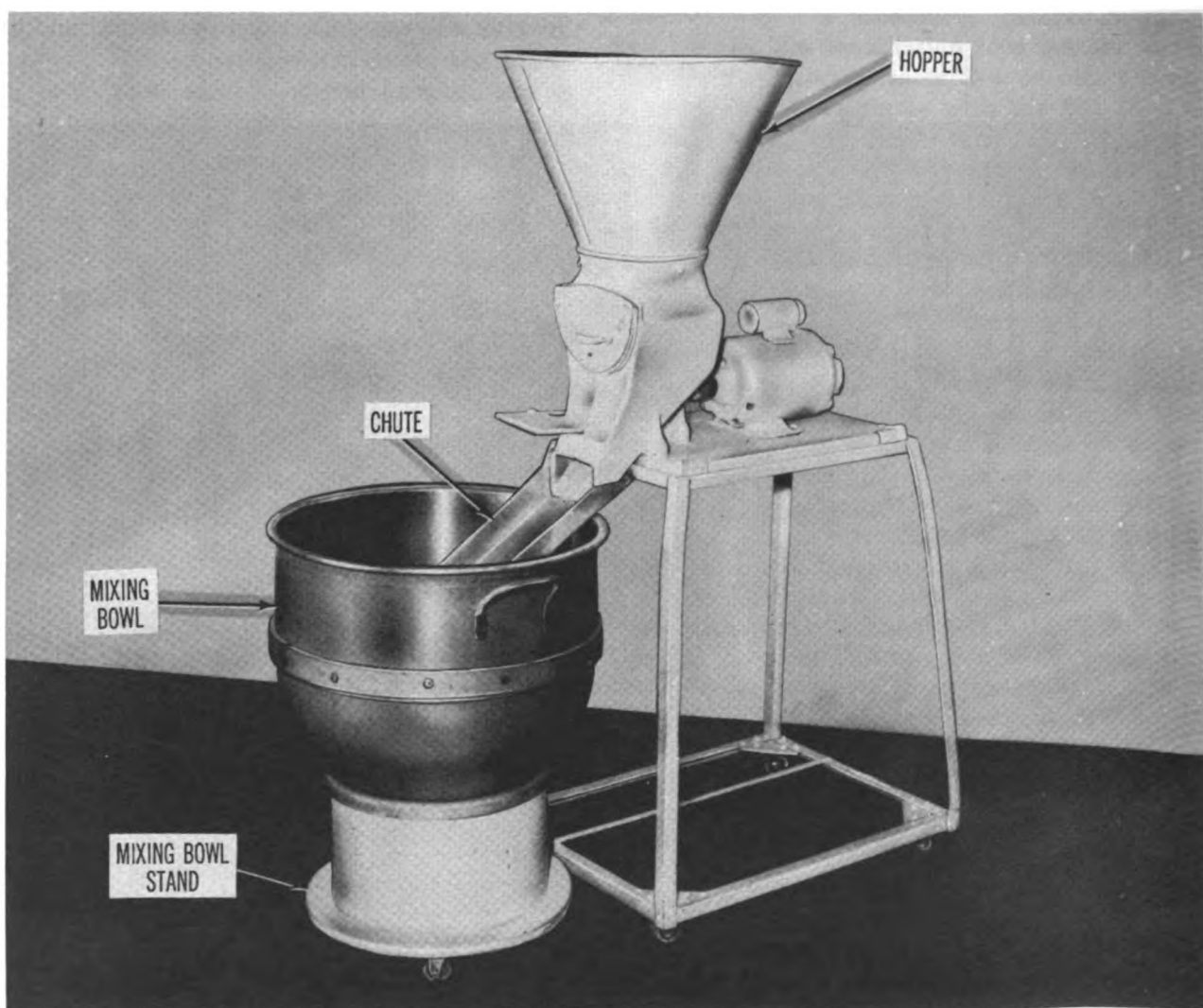


Figure 2. Electric Sifter

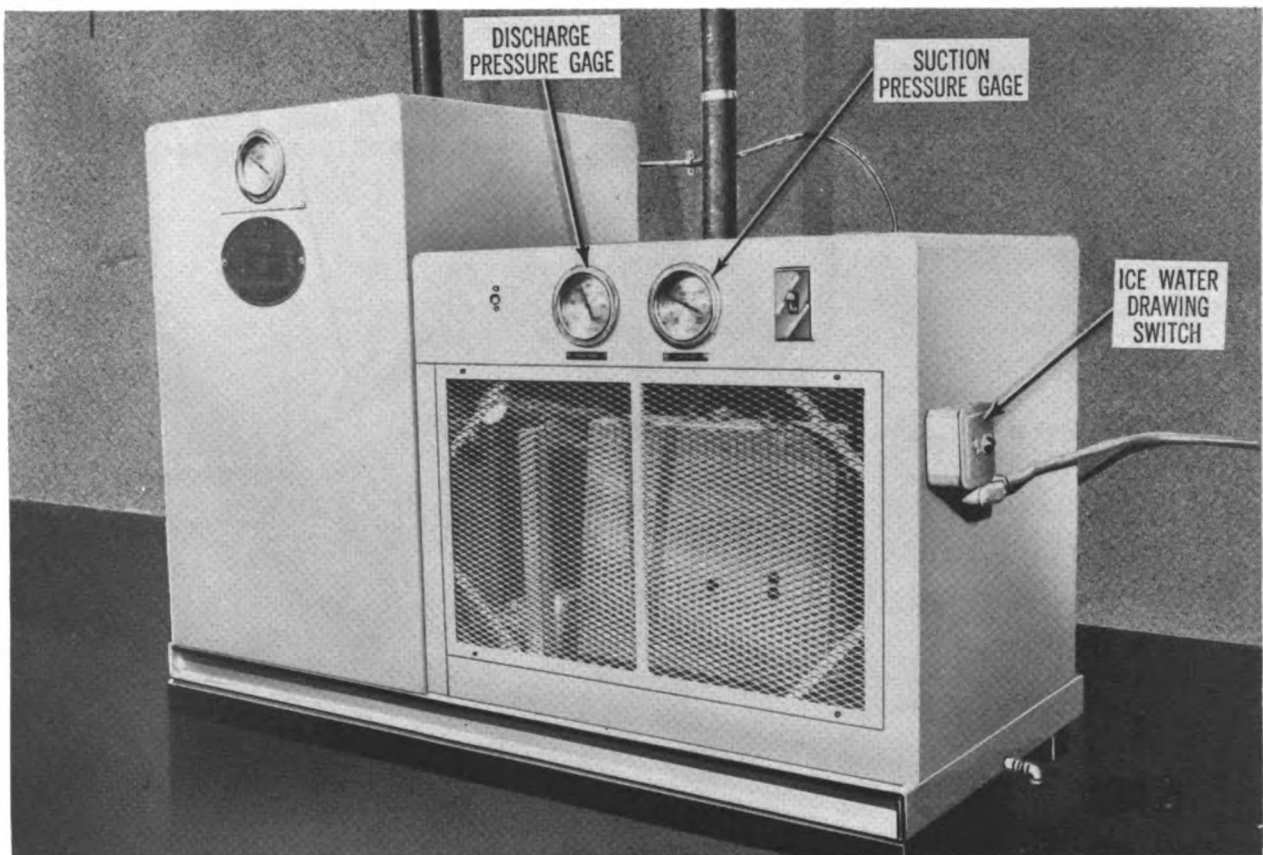


Figure 3. Ingredient water cooler.

position. Remove the hopper cover and dump flour into the hopper opening. If necessary, tap the outside of the hopper with the hand to start ingredient flow toward sieve chamber. Never insert an object into the flour because the object may catch in the oscillating cradle. When the flour has sifted into the container, turn off the switch and remove the plug from the outlet.

b. Cleaning. Lift the sieve locks that clamp over the studs projecting through the sieve and plate, and pull the sleeve assembly out. Dump out foreign matter that has collected on the screen; then thoroughly clean the screen. Replace the sieve in the machine and press the sieve locks into place.

16. Ingredient Water Cooler

The central pastry kitchen may use the ingredient water cooler (fig. 3) to temper the water to be used in the preparation of pastry items.

If the temperature of the water is controlled, the proper temperature of the mix is insured.

17. Pie Dough Rolling Machine

When a facility produces an average of 125 or more pies per day, the use of a pie dough rolling machine (fig. 4) is considered to be advantageous. A pie dough rolling machine, when properly adjusted, will save many hours in the production of pies. If the sheeting rolls are not in correct adjustment, rerolling will be necessary. Rollers should be set to roll out a piece of dough that is slightly larger than the pie tin being used. Rollers set too close together will cause the dough to tear and stick to the rollers.

18. Pie Trimmer Rimmer

The pie trimmer rimmer (fig. 5) builds up the edges of the pie shell, seals the top and bottom crusts, and trims the edges. Changeable

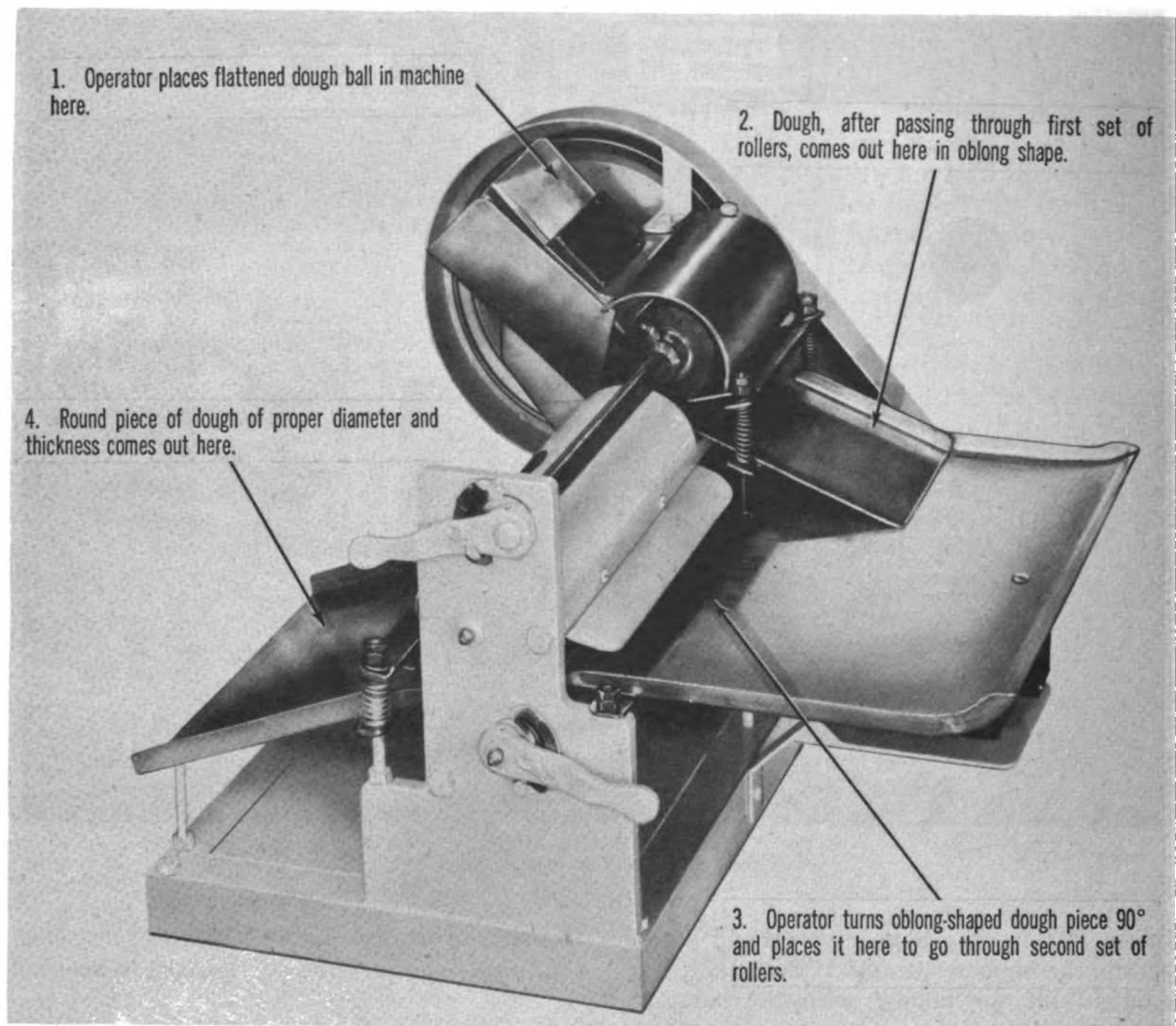


Figure 4. Pie dough rolling machine.

heads allow for different pie sizes and types of edges. To operate the machine, place the rolled pie dough in the pie plate, put the pie plate in the plate holder, and push down on the foot pedal. The plate holder will rise, carrying the dough to the revolving head.

19. Revolving Table

a. This piece of equipment (fig. 6) is a hand-operated 7-foot-diameter round revolving table designed for use in making pies. It streamlines the production flow of 9-inch pies and functions in conjunction with pie dough rolling machine (bottoms), filling operations, pie dough rolling machine (tops), and pie trimmer rimmer.

b. The proper use of the revolving table enables operations to be accomplished in a continuous flow of production, carrying pie bottoms in plates, filling pie shells, washing edge of bottom crusts, placing top crusts on pies, and carrying pies to the trimming machine.

20. Automatic Doughnut Machine

An automatic doughnut machine (fig. 7), available in some central pastry kitchens, enables kitchen personnel to turn out a great quantity of uniformly made doughnuts in a short time. The machine may be adjusted to produce the size of doughnuts desired, and a cutter shapes the doughnuts properly. The machine drops

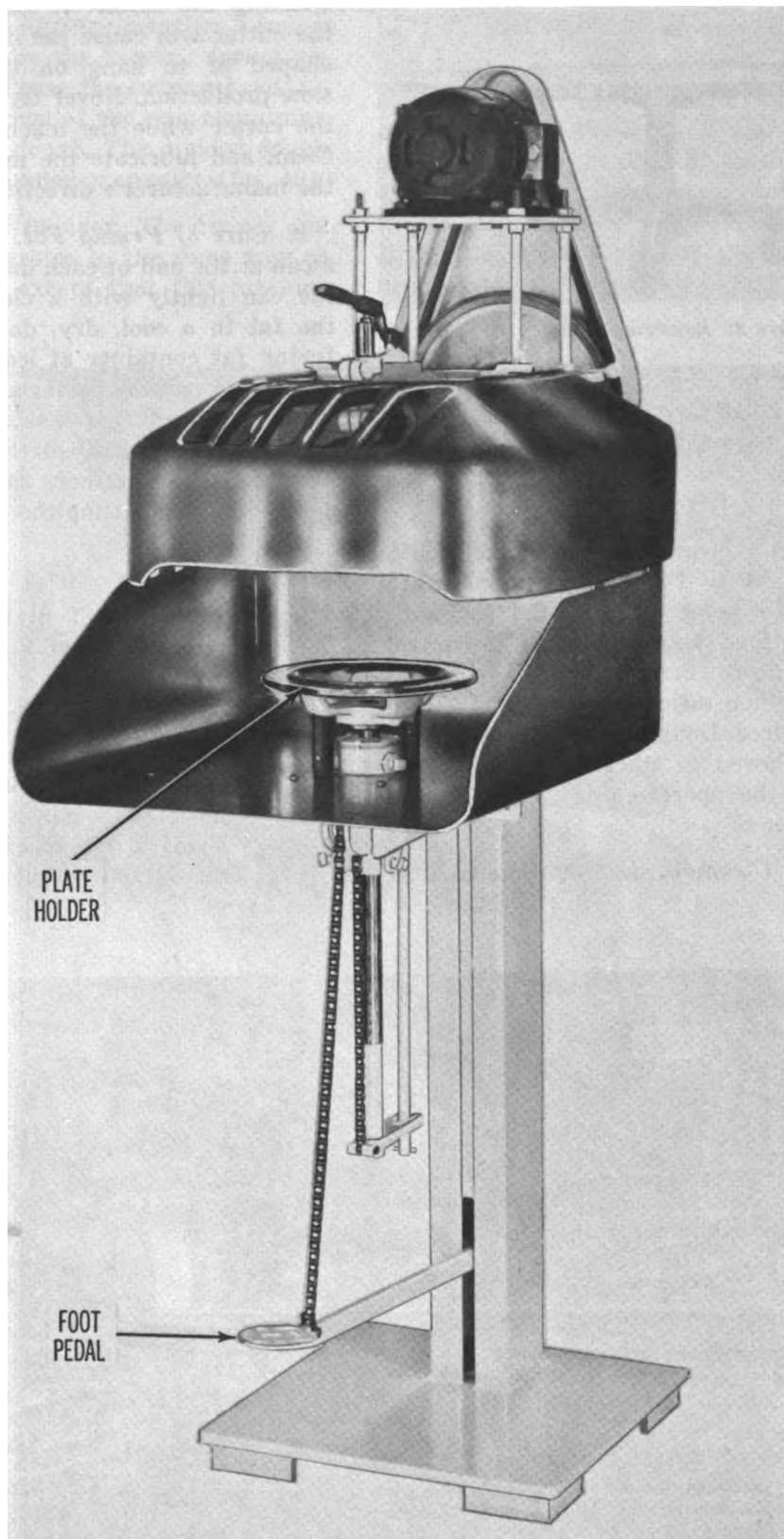


Figure 5. Pie trimmer rimmer.



Figure 6. Revolving table.

the doughnuts into hot fat to fry, flips the doughnuts over halfway down the tank so that they brown on both sides, and flips the finished products into a basket at the discharge end of the machine.

a. Operation. Cover the heating coils with fat and heat fat to the proper temperature (about 375° F.) before placing the dough in the hopper. Adjust the air pressure to control the doughnut size. Turn the machine on and make any further adjustments necessary to get the size desired. Doughnuts will be damaged if they are allowed to stack too high in the basket. When the operation is finished, turn off the machine.

b. Care and Cleaning. Use extreme care in

washing the cutter. A small nick or dent in the cutter will cause the doughnuts to be odd-shaped or to hang on the cutter and thus slow production. Never try to free dough from the cutter while the machine is in operation. Clean and lubricate the machine according to the manufacturer's directions.

c. Care of Frying Fat. Strain the fat into a can at the end of each day's operation. Cover the can lightly with a clean cloth and store the fat in a cool, dry, dark place. Wash the frying fat container at least once every week to remove gummy material that forms on the sides of the container. Use an approved cleaning compound and plenty of boiling water. After washing the container, thoroughly rinse and dry it before replacing the fat.

21. Roll Dividers

Hand-operated roll dividing machines cut the dough mass into 36 equal pieces.

a. Operation.

(1) *Divider.* To operate the divider (fig. 8), place dough to be divided in a lightly dusted dough press pan and insert the pan under the pressure head of the machine. Pull down on the handle to perform the pressing

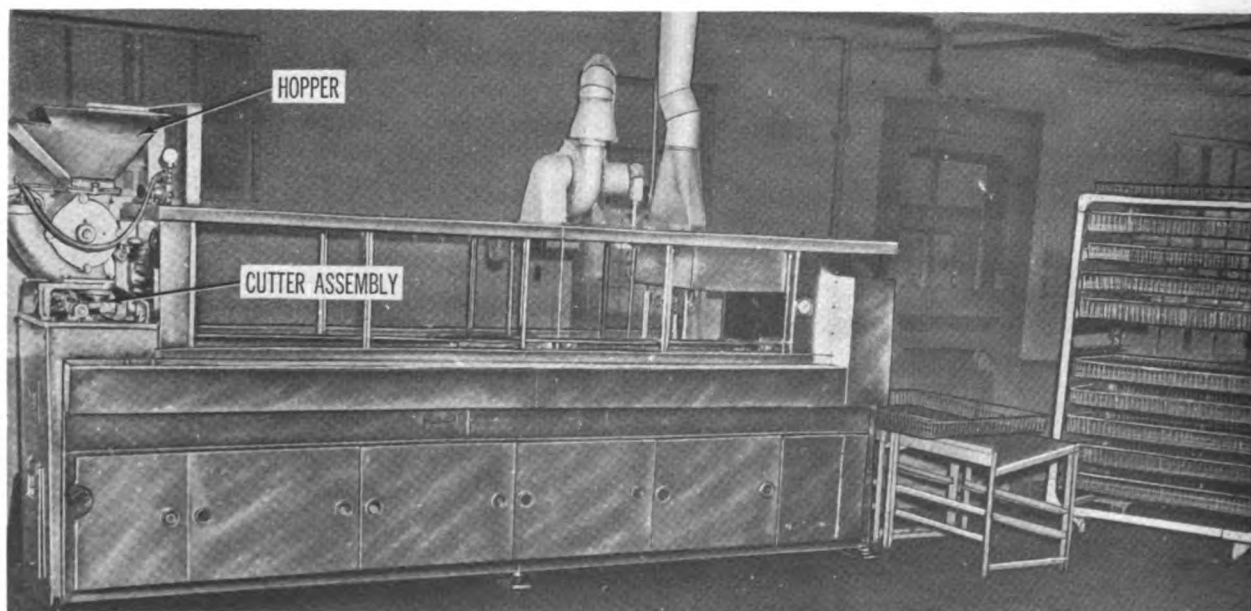


Figure 7. Typical doughnut machine.

action; then spring the trip lever to perform the cutting operation. Remove pressure from the handle; spring action will release the cutting head, allowing removal of the pan containing the divided dough. The divided dough must be rounded manually (fig. 49).

- (2) *Divider and rounder.* The divider and rounder operates in the same way as the divider except that this machine

rounds the divided dough pieces automatically (fig. 48).

b. *Cleaning.* The knives must be cleaned after each day's use. To clean the knives, withdraw the pin at the left side and turn the yoke so as to expose the face of the head. Pull up the catch on the back of the machine and hook it on the projection marked for that purpose. Bring the lever forward; the knives will be brought through the plate.

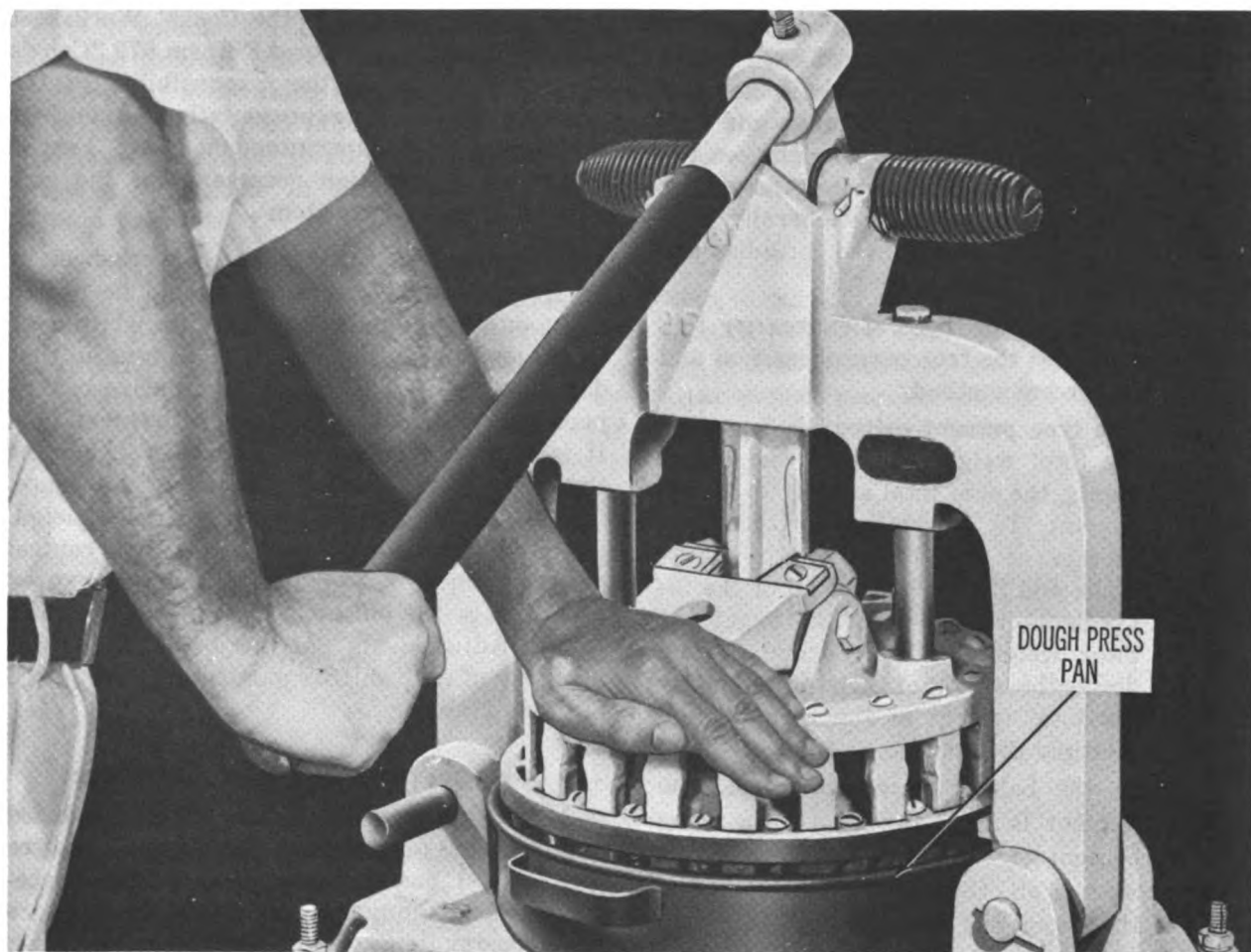


Figure 8. Hand-operated roll dividing machine.

Section III. PASTRY PRODUCTION PROCEDURES

22. Recipes

Army recipes for the quick breads, yeast-raised breads, and danish pastries listed in the

master menu and prepared by unit messes are contained in TM 10-412-5; recipes for cakes, cookies, and pies are contained in TM 10-412-6.

These recipes may also be used by central pastry kitchens. All Air Force recipes are contained in AFM 146-12.

23. Formula Construction

a. The term "formula construction" means the percentage of each ingredient contained in a baked product. Bakery laboratories, as a result of scientific research, have developed a percentage range of the maximum and minimum amounts of each ingredient that may be used in a baked item to produce the best results. By comparing these standard ranges of ingredients with the percentage of each ingredient being used in a formula, the baker can determine what change he can make and still keep the formula in balance. As long as the ingredients in the formula are within the proper range, the formula is balanced. Generally, it is not necessary to adjust approved formulas unless the finished product is faulty.

b. There are two methods of expressing formula percentages: the true percent method and the baker's percent method.

(1) The true percent method is based on the total weight of all of the ingredients, the sum total adding up to 100 percent. To determine the true percentage of each ingredient in a formula, add the weights of all of the ingredients in the formula to get the total weight of the formula; then divide the weight of each ingredient by the total weight of the formula and multiply the answer by 100.

(2) In the baker's percent method, 100 percent is used to express the flour content of the formula; the percentages of all other ingredients are based if 30 percent water is called for in a formula, the water content will be equal to 30 percent of the weight of the flour. To determine the baker's percentage of each ingredient in a formula, divide the weight of each ingredient by the weight of the flour and then multiply the answer by 100.

c. When increasing or decreasing recipes for baked items, the consistent use of approved formula percentages will produce the best re-

sults. The recipes for baked items in TM 10-412-5 and the cake recipes in TM 10-412-6 show the true percentage of each ingredient. These manuals also contain tables of baker's percentages of ingredients in the various recipes and instructions for increasing a recipe by the true percent method and by the baker's percent method.

24. Production Schedules

a. *Garrison Mess.* Army and Air Force pastry requirements are taken from the master menu and are listed on the Cooks' Worksheet (DA Form 3034-series or AF Form 679 "Cook's Work Sheet"). It is the responsibility of the mess steward or his representative (Army) or the dining hall superintendent (Air Force) to list all information necessary for the production of any pastry item.

b. *Central Pastry Kitchen.* A worksheet of the following day's schedule should be posted daily on the bulletin board, with written or typed copies of each formula to be used in that day's production. This will familiarize bakery personnel with their duties for the next day. It is the responsibility of the chief baker, or the shift leader in the chief baker's absence, to see that the schedule is properly completed. Production schedules that allow the central pastry kitchen to be closed on Sunday can be arranged by the officer in charge and the chief baker. Adjustments can be made to permit members of each shift to participate in required military training.

25. Baking Procedures and Techniques

Although the quantities of items produced and the types of equipment used in unit messes and central pastry kitchens vary, the procedures and techniques necessary to produce baked pastry items of high quality are the same.

a. *Scaling.* It is impossible to place too much emphasis on the importance of using accurate scales or of measuring ingredients accurately. Scales should be kept clean and in good condition; when the scales begin to get sluggish, they should be repaired or replaced. Faulty scales and careless scaling are largely responsible for faulty baked products. A reasonable degree of accuracy in weighing large quantities of materials can be achieved with heavy duty scales.

Small sensitive scales should be used for weighing small amounts of ingredients such as baking powder, baking soda, and spices. One ingredient must not be weighed on top of another. Very small errors in amounts of ingredients can materially alter the characteristics of a baked product. This is especially true when small batches are being prepared.

b. Mixing. The mixing and blending methods specified in the recipe should be followed to the letter. It is important that each mixing stage be timed properly so that maximum results in volume, texture, and tenderness of the finished product will be obtained. Both undermixing and overmixing must be avoided; either can cause production failure. Proper ingredient temperatures and mixing temperatures are equally important in producing satisfactory baked products.

c. Preparation of Pans. The pans used for baking must be clean and dry and should not be warped or dented. A dirty pan can cause a product to have an off-flavor; a warped or dented pan can cause a product to bake unevenly. Pans of the size specified in the recipe must be used, and the pans must be properly prepared. Recipes specify whether the pan is to be ungreased, lightly greased, or well greased. The grease used must be fresh; rancid grease can give the product an off-flavor.

d. Makeup. Correct makeup procedure is essential in obtaining cakes, yeast-raised goods,

and pastries of high quality. The weight and shape of the dough piece before baking has a direct relationship to the finished product. The use of too much dusting flour can sometimes produce inferior baked products.

e. Baking. Successful production of pastry products is not possible unless correct baking methods and procedures are followed. To produce baked products of the best quality, preheat oven to the temperature specified in the recipe before putting pans in the oven; use the baking time specified in the recipe as a guide, and remove the pan from the oven at the proper time. Overbaking or underbaking usually is the result of carelessness or lack of knowledge on the part of the cook or ovenman. Follow instructions in the recipe regarding cooling and removal of the product from the pan.

f. Finishing. Cakes, sweet rolls, and danish pastries attractively frosted or iced are appealing to the soldier and add a satisfactory finishing touch to any meal. Cakes must be thoroughly cooled before they are frosted. Sweet rolls and danish pastries usually are iced or glazed while they are still warm.

g. Storage of Baked products. All baked products must be thoroughly cooled before they are stored. The products must be stored in a clean, dry, well-ventilated place and in such a manner that they cannot pick up odors from other foods.

Section IV. ACCOUNTING PROCEDURES

26. General

When pastry products are prepared at the unit mess, the mess receives, as a part of its normal ration issue, the ingredients necessary for the preparation of the pastry items listed on the revised installation menu. When a central pastry kitchen is operated by an installation, the ingredients necessary for the preparation of the pastry items listed on the revised installation menu are requisitioned in accordance with AR 31-200 or AFM 146-1 and are issued directly to the central pastry kitchen. Army central pastry kitchens use DA Form 3161 (Request for Issue or Turn-In) for requisitioning the ingredients; Air Force central

pastry kitchens use AF Form 287, Subsistence Request. The accounting procedures described in paragraphs 27 through 29 pertain only to central pastry kitchens.

27. Receipt of Ingredients and Production Records

a. Army Procedures. DD Form 157, Central Pastry Kitchen Production Record and Summary of Stores (figs. 9 and 10), is used to keep a running inventory of all ingredients in the storeroom of the Army central pastry kitchen and to check the quantities of ingredients used against the number of items produced. A complete check should be made daily to insure that

the proper number of end items has been obtained from the ingredients used.

- (1) When the items requisitioned on DA Form 3161 are received, the officer in charge of the pastry kitchen, or other person authorized to receipt, checks the ingredients listed on the form against the ingredients actually received and makes any adjustments that may be necessary. After the ingredients have been checked, they are stored immediately in the stockroom or refrigeration facilities of the pastry kitchen. The quantities of ingredients received are posted on the back of DD Form 157 (fig. 10) in the "received" column.
- (2) Ingredients used to make pastries are itemized on the front of DD Form 157 (fig. 9) as they are used. Dusting flour and pan grease must be included. At the end of the day, totals of items used are entered on the bottom line of the form. These totals are then posted in the "used" column on the back of the form (fig. 10).
- (3) On completion of the daily inventory of each ingredient, the officer in charge transfers totals in the "balance on hand" column to the "balance forwarded" column on the back of a new DD Form 157, thus continuing the inventory from day to day.

b. Air Force Procedures. Air Force records are kept in accordance with AFM 146-1.

28. Delivery and Receipt of Pastry Items

The central pastry kitchen is responsible for the distribution of baked pastry items. A delivery schedule must be worked out by the officer in charge to minimize the time between the production and consumption of the finished

products. Cabinets, sheet pans, pie tins, and other nonexpendable receptacles used by the central pastry kitchen to deliver baked products to the messes must not be left in any mess unless that mess turns over to the deliveryman, at the time of issue, the cabinets or pans from the previous delivery. (In this connection, see par. 7e).

a. Army Procedures. All pastry items produced in Army central pastry kitchens are issued to the messes on DA Form 10-261 (Pastry Issue Slip) (fig. 11). The issue clerk prepares the necessary tally in duplicate, listing thereon the items and quantities to be issued to the various messes. The officer responsible for the operation of the mess or his representative receives the pastry items and receipts the form for the quantities actually received.

b. Air Force Procedures. The Air Force uses AF Form 129 (Tally In/Out) for issue of pastry items produced in central pastry kitchens.

29. Formal Inventories

a. Army Procedures. The quantities of pastry ingredients on hand in the central pastry kitchen are inventoried during a formal inventory at the end of each accounting period in accordance with AR 31-200. The inventory is conducted by the officer in charge of the central pastry kitchen or by the commissary officer and a disinterested inventory officer. The quantities of ingredients on hand when the inventory is taken are listed on DD Form 1150-1. The ingredients listed on the form are transferred only on paper to the commissary and are reissued by the commissary to the central pastry kitchen as the first issue in the ensuing accounting period.

b. Air Force Procedures. Air Force inventory procedures are contained in AFM 146-1.

Figure 9. Front of a completed DD Form 157.

SUMMARY OF STORES - BROKEN LOTS ON HAND													
INGREDIENTS	UNIT	BAL FWD	REC	TOTAL ACCT	USED	BAL ON HAND	INGREDIENTS	UNIT	BAL FWD	REC	TOTAL ACCT	USED	BAL ON HAND
Almond Paste							Mace	1/2-oz CAN	12	0	12	0	12
Allspice							Margarine						
Apples, Canned							Meringue Powder	No. 2 CAN	15	0	15	0	15
Apples, Dehy.	No. 10 CAN	12	0	12	0	12	Milk, Dry, NONFAT	LB.	200	100	300	13 1/4	286 1/2
Applesauce							Milk, Evaporated						
Apricots, Canned							Mincemeat						
Baking Powder	LB.	10	0	10	2 1/5	7 1/5	Molasses						
Baking Soda	1-LB CT.	6	0	6	0	6	Nutmeg						
Bananas							Nuts, Mixed						
Butter	LB.	50	0	50	1	49	Peaches, Canned	No. 10 CAN	60	60	120	0	120
Cereal							Peaches, Frozen						
Cherries, Canned, RSP	No. 10 CAN	12	96	108	0	108	Pecans						
Cherries, Frozen, RSP							Pineapple						
Cinnamon	4-oz CAN	16	0	16	0	16	Prunes, Dried						
Cloves							Pumpkin						
Cocoa	LB.	12	0	12	0	12	Raisins	LB.	30	0	30	0	30
Coconut							Salt Oil						
Cream of Tartar	1-LB CAN	6	0	6	0	6	Salt	LB.	60	0	60	5 1/2	54 1/2
Eggs, Dry							Shortening, Class 2						
Eggs, Fresh	Doz.	90	0	90	0	90	Shortening, Regular	LB.	350	0	350	62 1/2	287 1/2
Eggs, Frozen, White							Starch (Water Soluble)						
Eggs, Frozen, Whole	LB.	90	0	90	19 1/4	70 1/2	Sugar, Brown	1-LB CT.	24	0	24	0	24
Eggs, Frozen, Yolk							Sugar, Granulated	LB.	400	2000	2400	120	2280
Flavoring, Lemon	8-oz BTL	12	0	12	0	12	Sugar, Powdered	1-LB CT.	300	0	300	0	300
Flavoring, Maple							Sirup						
Flavoring, Orange							Vinegar	1-qt BTL	24	0	24	0	24
Flavoring, Vanilla	8-oz BTL	24	0	24	4	20	Walnuts						
Flour, Hard	LB.	2000	0	2000	210	1790	Yeast, ACTIVE DRY	LB.	6	24	30	4 1/2	25 1/2
Flour, Soft	LB.	1600	0	1600	102	1498							
Food Coloring													
Ginger													
Jelly	LB.	28	0	28	0	28							
Juice													
Lemons													

Figure 10. Back of a completed DD Form 157.

DA FORM 10-261
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CHAPTER 3

SANITATION AND SAFETY

Section I. SANITATION

30. Personal Cleanliness and Health

All personnel in the mess or central pastry kitchen should observe the following basic rules of cleanliness and health.

a. Cleanliness.

- (1) Keep the body clean. (Facilities should be available for personnel to take hot and cold showers before changing into their uniforms for work.)
- (2) Wear clean white uniforms, including headgear, while on duty. Always keep armpits covered. Turn in soiled whites according to schedule. Launder personal clothing items frequently.
- (3) Wash hands with soap and water before beginning work and when returning to work after any absence, particularly after using the toilet. Lather the hands well in hot water, rinse, and dry on individual towels.
- (4) Keep hair well groomed and clean.
- (5) Brush teeth each day.
- (6) Keep fingernails short and clean.
- (7) Do not use common drinking cups, eating utensils, or toilet articles until they have been thoroughly sanitized.
- (8) Avoid coughing and sneezing when working around food and equipment.
- (9) Do not smoke or chew gum or tobacco in the operating parts of the bakery.

b. Health.

- (1) Personnel having ailments such as acute colds, lingering coughs, or any definite symptoms of illness should see a physician. Persons having skin eruptions or infectious cuts should never be allowed to work with food.

- (2) Unit commanders and officers in charge of central pastry kitchens must refer all prospective permanent food handlers to the installation surgeon for examination prior to assignment to duty. Records based on the findings of the examining physician should be filed by the mess officer or central pastry kitchen officer and should be transferred as part of the soldier's records on permanent change of station.

31. Care of Equipment

Equipment must be cleaned properly and promptly after each day's use so that the growth of micro-organisms and the accumulation of dirt and grease will be prevented. Personnel may find it necessary to improvise cleaning utensils that will reach into cracks and crevices in some pieces of equipment. Following are some general rules that cover the cleaning of equipment used in pastry baking. Additional information is contained in paragraphs 12 through 21.

a. Remove dusty materials, such as flour and baking powder, with a brush or cloth. If dust is in hard-to-reach places, it may be removed with a vacuum cleaner (authorized in central pastry kitchens) or brushed out with a bristled brush. Avoid the use of a steel-bristled brush because the steel bristles will scratch the surface of the equipment and make it more difficult to clean.

b. Remove oil, grease, and foreign material that has hardened on the equipment with a brush or cloth that has been dipped in a detergent solution. For best results, change the detergent solution frequently.

c. After thoroughly cleaning the equipment, wipe it dry to prevent rust, corrosion, or the accumulation of dust on the damp surface.

d. Wash bowls, paddles, beaters, and other detachable parts of machinery that come in direct contact with food with a soap or detergent solution and rinse thoroughly.

e. Clean ovens, cookers, and mixers inside and out after each day's use. Take care at all times to prevent spilling materials that will harden during the time that the equipment is being used.

f. Keep refrigerators neat and clean. Defrost refrigerators at regular intervals and clean with soap or detergent and water.

32. Insect Control

The procedures recommended for the control of insects in messes and in central pastry kitchens are listed below.

a. Prevention.

- (1) Screen all doors, windows, and ventilators with ordinary wire of not less than 18 meshes per inch or with heavy copper wire of 16 meshes per inch. Be sure that screens open outward and that they are kept in good condition.
- (2) To prevent the entrance of crawling insects, tightly seal all openings in building floor, walls, and ceilings. Be sure that openings around pipes are tightly sealed at points where pipes enter the building.
- (3) Cover all floor drains with a metal grating. If grating openings are large enough for insects to enter, face the bottom of the gratings with metal screening.
- (4) Carefully inspect all incoming supplies for insect infestation.
- (5) Frequently inspect all supplies stored in the building for insect infestation. Remove any contaminated supplies immediately.

b. *Extermination.* Insects may be exterminated with disinfectants, insecticides, and fumi-

gants. Installation engineers should be called in to exterminate insects when necessary. It is desirable to have exterminating done when there is as little activity as possible in the building and when supply levels are at a minimum.

33. Rodent Control

Rodents are carriers of many diseases harmful to man. Rats transmit yellow jaundice, typhus, food poisoning, and tapeworms and other intestinal parasites. Ingredients contaminated by rodents must be destroyed immediately. The methods used for rodent control are discussed below.

a. *Prevention.* To prevent the entrance of rodents, tightly seal the building and keep it well cleaned. Carefully examine all incoming supplies to prevent the entrance of rodents or rodent-contaminated ingredients.

b. *Extermination.* If rodents should get into the building, they must be exterminated. On request, the installation engineers will take the necessary action to trap or poison rodents.

34. Salmonella Food Poisoning

a. The term "salmonella" refers to a group of bacteria consisting of 900 species or serotypes. The organisms with which this manual is concerned are the salmonellae which frequently contaminate foods and cause symptoms of food poisoning, the severity of which depends on the species and strain of bacteria, the number of organisms in the offending food, and the susceptibility of the consumer. In central pastry and mess kitchens, the most common source of infection is eggs; however, salmonellae have also been found in flour and dried coconut.

b. Infected ingredients are a serious hazard. They may cause contamination if the food in which they are used is not adequately cooked, if containers (principally egg cans) are re-used, or if contaminated dust or droplets infect other products during subsequent handling.

c. Central pastry kitchen and mess kitchen personnel should take the following precautions for control of contamination.

- (1) Use only specification ingredients.

Frozen eggs and meringue powder procured and inspected, as provided in current specifications, should be "salmonella free."

- (2) To minimize possible contamination from airborne sources or from other factors, keep ingredient containers covered at all times when not in actual use.
- (3) Thaw frozen eggs in cold running water or at refrigerator temperature. The practice of thawing frozen eggs at room temperature permits rapid growth of organisms which might contaminate the eggs.
- (4) Keep thawed eggs at 45° F. or below until used.
- (5) Never use egg cans in any production operation or for the storage of ingredients or partially finished products. Egg cans are manufactured as *single service* containers and are not designed to be reused. Washing techniques employed in central pastry kitchens and messes do not guarantee the destruction of bacteria which may be held in the seams of the can. These bacteria can contaminate anything which may subsequently be placed in the can. Wash the egg cans as soon as they are empty and discard them immediately.
- (6) Mops and rags which have been used to mop up eggs or other materials that might be contaminated should not be used again until they have been sterilized or sanitized.
- (7) Do not handle the product more than is necessary. Hand dipping and hand finishing materially increase the opportunity for recontamination of the product.
- (8) Use only seamless equipment, which can be adequately cleaned and sterilized, in the preparation and handling of cream fillings and other perishable items.
- (9) Make certain that temperatures used in the production of cream fillings are adequate to destroy the microbial population. Cream filling should be heated to at least 185° F.
- (10) Pie shells should be filled with cream filling after the filling has been cooked and while it is still hot. Filling that has been cooked sufficiently will have a low bacterial count. If the filling is dispensed hot, the chance for contamination of the filling during the production of the individual pies will be reduced.
- (11) Destroy any leftover cream filling (AR 40-5). Do not blend it with fresh-filling the next day because the leftover filling could well have become contaminated during storage.
- (12) Promptly refrigerate any cream-filled or custard-filled products. Should these products be contaminated with small numbers of harmful organisms, proper refrigeration will prevent their developing in sufficient numbers to cause infection.
- (13) Do not develop a false sense of security through using synthetic fillings which, by themselves, are incapable of supporting bacterial growth. The U.S. Public Health Service has demonstrated that such fillings, when in contact with more nutritious materials such as pie shells, will permit micro-organisms to live and even to increase in numbers.

Section II. SAFETY

35. Safety Program

The mess officer or officer in charge of a central pastry kitchen may use the following list of approved safety measures as a guide for setting up a safety program in his organization.

a. Have all equipment checked to eliminate mechanical hazards.

b. Stress the the importance of obeying all safety rules and regulations.

c. Encourage personnel to present safety suggestions.

d. Display safety posters in advantageous places.

e. Train all new bakery personnel in accident prevention, emphasizing the following points:

- (1) Safe practices that must be followed to overcome specific hazards of the job.
- (2) Use of proper equipment, utensils, and tools at all times.
- (3) Elimination of slippery spots on the floors.
- (4) Not carrying items in shirt pockets.
- (5) Not wearing rings or other jewelry.
- (6) Use of proper safeguards when working on machines.

f. Require personnel to report for treatment immediately after an accident.

36. Safe Use of Equipment

Personnel must be taught to keep all equipment guards and safety devices in good working condition and to observe the specific safety rules given below.

a. Dough and Cake Mixers.

- (1) Become thoroughly familiar with controls before attempting to operate a mixer.
- (2) Check mixer bowl before use to be sure that no tools or other objects have been left in it.
- (3) Always secure beater or other accessory to the vertical shaft of the mixer before starting the machine.

- (4) Be sure that hands are dry before operating starter switch.
- (5) Do not rest fingers on edges of bowl while machine is in operation.
- (6) Remember that the mixer accessory makes a number of revolutions after the power has been shut off.

b. Ovens.

- (1) Provide adequate protection against burns by using authorized bakery pads (FSN 7330-379-4439).
- (2) Establish correct procedures for handling and dumping hot pans.
- (3) To avoid eye injury from steam and heat, establish correct procedures for positioning the head while reaching into a hot oven.

c. Doughnut Machines.

- (1) Never try to free dough from cutters when the machine is operating. Stop the machine and remove any dough or crippled doughnuts lodged in the machine.
- (2) Avoid contact with hot fat. Remember that fat remains hot for some time after the heating elements are shut off.
- (3) Take care when draining fat from the machine. Wipe up any spilled fat immediately and clean any slippery floor area.

d. Steam Kettles.

- (1) Guard against burns from escaping steam or from metal sides of kettles.
- (2) Be sure that safety valve is always in good working order.

CHAPTER 4

INGREDIENTS

Section I. FLOUR

37. General

Flour is the principal ingredient used in the production of pastry items. It constitutes the bulk of the ingredient mixture (except in high sugar-to-flour ratio cakes), and the action of its components determines the structure and form of the finished product. For this reason, the baker should know the grade, composition, and characteristics of each type of flour available for his use.

38. Types

The two type of flour procured by the Armed Forces for pastry baking are bleached during the milling process. Freshly milled flour is yellowish in color because it contains carotinoid pigments. The bleaching process removes the color and artificially matures the flour through the use of chemical agents. Maturing the flour improves the baking qualities.

a. Type I, Hard Wheat Flour. Hard wheat flour has the following physical characteristics:

- (1) White or creamy white color.
- (2) Sharply granular texture.
- (3) Does not pack easily when squeezed.
- (4) Flows or dusts readily.

b. Type II, Soft Wheat Flour. Soft wheat flour has the following physical characteristics:

- (1) White color.
- (2) Soft feel.
- (3) Packs easily when squeezed.
- (4) Does not flow or dust readily.

39. Grades

Hard and soft types of wheat flour are manufactured in the basic grades described below.

a. Patent. Patent flour is the most refined

type of flour obtained from the milling of wheat. It contains a minimum of bran specks and, when milled from hard wheat, is capable of yielding a high quality gluten. Patent flour is sometimes separated into short patent and long patent grades, the former being the higher grade.

b. Low Grade. Low grade flour, which consists of only 3 to 5 percent of the total flour obtained from the milling of wheat, contains considerable bran and dirt. It is obtained at the first and last stages of milling and is generally used for sizing paste or animal feed.

c. Clear. Clear flour is that part of the flour remaining after separation of the patent flour and the low grade flour. It is classified either as first clear or second clear. It has a high protein content and is used in the production of variety breads.

d. Straight. Straight flour, the type procured by the Armed Forces, is the total run of patent flour and clear flour. Although not so high in quality as patent flour, straight flour can be made into pastry products of high quality. When part of the patent flour is removed from the straight flour, the remainder is known as cut straight flour. When clear flour from another run is added, the product is known as stuffed straight flour.

e. Enriched. Vitamins and minerals such as thiamin, niacin, iron, and riboflavin are frequently added to flour to replace the food values lost in milling. Flour treated in this manner is known as enriched flour.

40. Composition

a. Moisture. Wheat flour usually contains from 9 to 15 percent moisture; however, the

flour procured for the Armed Forces contains a maximum of 13.8 percent moisture when milled. Flour either absorbs moisture or loses it in storage, depending on atmospheric conditions.

b. Starch. Wheat flour contains from 70 to 75 percent starch. The starch granules absorb water during fermentation and in the early part of the baking period and thus give bulk to the dough mass. Starch also supplies food for the yeast plants. Enzymes reduce some of the starch to compound sugars which, when reduced to simple sugars, can be used for food by the yeast.

c. Proteins. There are five different proteins in wheat flour, but the two principal proteins are gliadin and glutenin. When combined with water, these proteins form gluten, a tough elastic substance that forms the structure of baked goods and gives the dough the necessary strength and elasticity to retain leavening gas. Leavening gas must be retained if baked items are to have the desired volume and texture.

d. Fat. Wheat flour contains approximately 1.5 percent fat. The major portion of the fat of wheat grain is removed during the milling process.

e. Minerals. Mineral matter in wheat flour, commonly called ash, consists of the phosphates of lime, magnesium, and potassium. The ash content runs from about 0.4 percent to about 0.48 percent. Enriching adds to the ash content of the flour.

f. Enzymes. There are two principal enzymes in wheat flour: diastase and protease.

- (1) *Diastase.* Diastase liquefies starch, converting it to malt sugar. This compound sugar is then converted to a simple sugar, dextrose, by an enzyme present in the yeast. The yeast feeds on this simple sugar. Some diastatic strength is necessary to provide sugar for the yeast used in making bakery products, but high diastatic strength is not desirable because it causes the dough to become slack and sticky. The diastatic strength of flour usually is controlled by blending wheats before milling or by treating the flour during milling.

- (2) *Protease.* Protease softens gluten and makes it elastic. Because flour tends to have a high protease content, the baker should familiarize himself with the following facts.

- (a) Protease activity varies with the age of the flour; it is reduced by both natural and artificial aging.
- (b) Water containing dissolved minerals favorably restricts protease activity.
- (c) Milk contains a substance that is harmful to gluten. If milk is heated almost to the boiling point, this substance is destroyed. For this reason, milk products that are processed in part by heating, such as evaporated milk or nonfat dry milk, are recommended for large-scale baking.

41. Characteristics

The characteristics of wheat flour that may affect the quality of bakery products are discussed below.

a. Color. The color of the flour depends on the kind of wheat from which the flour was milled, the degree of refinement, and the bleaching process. The natural color of hard wheat flour is creamy white; the natural color of soft wheat flour, chalky white. Impurities or bran specks in flour give it a grayish color or speckled appearance.

b. Odor. The odor of flour is sometimes affected by the presence of other vegetation that may have been harvested and milled with the wheat. Also, flour that is improperly stored may absorb foreign odors. Because objectionable odors in flour may be transmitted to pastry products, flour should be inspected before use to determine if it has the pure odor of freshly ground wheat.

c. Ability to Absorb Water. The ability of flour to combine with water varies with the type and character of the wheat from which the flour was milled and the conditions under which the flour was stored.

d. Strength. The strength of flour is measured by the quality of the gluten formed from the flour. If the gluten is tough, elastic, and durable, the flour is strong. If the gluten is

easily broken and lacks elasticity, the flour is weak. Strong flour from hard wheat generally is preferred when strong gluten is required, as in yeast-raised doughs. Weak flour from soft wheat is preferred for making cakes or other products where fewer gluten-forming proteins are required.

e. Tolerance. Tolerance in hard wheat flour means the ability of the flour to produce satisfactory results over an extended fermentation period.

42. Storage

If a good patent flour or straight flour is properly stored, it will keep for 6 months without noticeable change. Improper storage may result in mold growth, insect infestation, or rapid deterioration of the flour. Also, flour may pick up foreign odors if it is improperly stored. Because proper storage conditions are difficult to maintain, only as much flour as is required to assure uninterrupted baking operations should be kept on hand. Following is a guide for storing flour.

a. Store flour apart from materials having an objectionable odor. If possible, designate one room for the storage of flour only.

b. If possible, keep flour at a uniform temperature not higher than 70° F. and at a relative humidity of 65 percent. Excessive heat or humidity causes rapid deterioration of the flour.

c. When stacking flour, follow these rules:

- (1) Stack flour on skids or dunnage at least 5 inches above the floor.
- (2) Place sacks on dunnage or skids by

the header and stretcher method, stacking the bags of flour not more than 8 courses high with an additional sack on top, thereby making a maximum of 25 sacks to the stack.

- (3) If a low building or tent is used for storage, make sure that stacks of flour are low enough to allow adequate space between the top of the sacks and the roof so that the air can circulate properly.
- (4) Arrange sacks of flour so that the oldest flour will always be used first.
- (5) Be sure that prescribed floor load limits are not exceeded.

d. Because absolute cleanliness is essential to prevent infestation by weevils, roaches, and other insects, the following rules should be rigidly followed.

- (1) Sweep and inspect flour storerooms frequently. Loose flour lying under dunnage, on walls, and in the aisles will attract insects and rodents.
- (2) Keep empty unwashed sacks and refuse away from the flour.
- (3) After all sacks of flour have been removed from the skid or dunnage, brush loose flour away and thoroughly spray the skid or dunnage and the floor of the storeroom with an approved insecticide. Also spray the floor of the storeroom at regular intervals.
- (4) Inspect all flour before it is placed in the storeroom. Inspect the flour frequently for signs of rodent or insect infestation.

Section II. WATER

43. General

The action of water during the mixing and baking processes is due both to the liquid nature of the water and to its dissolved mineral content. During the mixing process, water dissolves sugar, salt, and other water-soluble ingredients; it serves as a yeast-dispersing agent and dissolves the yeast food necessary to promote yeast activity. Water makes chemical leavening possible. It also helps in the forma-

tion of gluten and softens the starch in the flour so that the starch is incorporated with the gluten to form a uniform mixture. The amount of water used in a formula regulates the consistency of the dough or batter, and the temperature of the water helps to control the dough or batter temperature. During the baking period, water forms steam to supplement the action of the leavening agent. Water that is not removed from the mix during baking pro-

vides moisture in the finished product, keeping the product soft for a longer time.

44. Types

The mineral content of water determines whether the water is hard, soft, alkaline, acid, or sea (salt) water. Temporarily or slightly hard water (*b* below) is best for baking; however, permanently hard, soft, alkaline, or acid water may be used with satisfactory results if minor changes are made in the formula. Sea water is used only in an emergency, and then only if its use has been approved by proper authority. The types of water and the mineral content for each are discussed below.

a. Methods of Identifying Types. To determine if water is hard or soft, place some water and soap in a closed container and shake the container. If lather is slow to form, the water is hard; if lather forms readily, the water is soft. Alkaline water can be identified by placing a piece of red litmus paper in water; if the paper turns blue, the water is alkaline. Acid water can be identified by placing a piece of blue litmus paper in water; if the paper turns red, the water is acid.

b. Hard Water. Hard water contains appreciable amounts of dissolved minerals such as calcium, magnesium, and iron. If the minerals can be made to settle out by boiling the water, the water is said to be temporarily hard. If the minerals can be removed only by special chemical treatment, the water is said to be permanently hard. Temporarily or slightly hard water is most desirable for baking because the minerals in the water strengthen the gluten. The minerals in permanently hard water may slow fermentation in yeast-leavened products by excessively toughening the gluten.

When permanently hard water is used, it may be necessary to increase the amount of yeast in the formula.

c. Soft Water. Soft water is relatively free of dissolved minerals. When used in yeast-raised doughs, very pure or soft water has a tendency to soften the gluten and produce a sticky dough. Also, doughs made with soft water will ferment faster than those made with hard water. Therefore, the percentage of salt in the formula must be increased slightly when soft water is used; salt strengthens the gluten and also retards fermentation.

d. Alkaline Water. Alkaline water contains small amounts of alkaline minerals, such as sodium carbonate, which have been dissolved from the soil. The alkaline minerals partly neutralize the acidity of yeast-leavened doughs. As a result, gluten does not ripen normally; and the activity of the enzymes is reduced so that fermentation is slowed and the dough becomes weak. To counteract the effects of alkaline water, a small amount of vinegar may be added to the dough. As a starting point, use 1 pound of vinegar per 100 pounds of flour.

e. Acid Water. At times water may contain sulfur compounds that make it acid. Acid water increases the acidity of yeast-leavened doughs and hastens fermentation. Caution should be practiced when acid water is used because it causes the dough to age quickly.

f. Sea Water. Sea water contains varying amounts of salt. When it is necessary to use sea water (and its use has been approved by proper authority), the salt must be left out of the mix entirely or the amount of salt used must be reduced. The exact amount to be used must be determined by baking tests.

Section III. SUGAR

45. General

Sugars belong to a group of compounds, called carbohydrates, which are composed of three elements: carbon, hydrogen, and oxygen. Sugars have the following characteristics: They taste sweet in varying degrees; they dissolve easily in water; their solutions will ferment; and most of them will crystallize in well-defined forms.

46. Classifications

Although there are more than 100 existing sugars, it is possible to confine the sugars used in dough preparation to two classifications.

a. Simple Sugars. Simple sugars are those upon which yeast can act directly to form alcohol and carbon dioxide gas. The principal simple sugars of importance to the baker are dextrose, fructose (levulose), and invert sugar.

- (1) *Dextrose*. Dextrose, also known as corn sugar, starch sugar, or grape sugar, is found naturally in fruit juices and honey. Dextrose, found also in flour, is readily fermented by yeast into alcohol and carbon dioxide gas.
- (2) *Fructose*. Fructose, or levulose, is often called fruit sugar. Usually found with dextrose, fructose is present in molasses, honey, and fruit juices. The presence of only a small quantity of this sugar will retard the crystallization of any dextrose and cane sugar that may be present with it.
- (3) *Invert sugar*. When equal parts of dextrose and fructose are combined, the mixture is known as invert sugar. Invert sugar occurs as such in nature, and it is also produced by the action of heat and acid on cane sugar. In a yeast dough, the action of invertase, the yeast enzyme, converts cane sugar to invert sugar.
- (2) *Maltose*. Maltose, known as malt sugar, is the form of sugar present in malt. Maltose exists in flour but usually not to a great extent. It is manufactured or formed by the action of the flour enzyme diastase on starch. After the malt sugar is formed, it is acted upon by the yeast enzyme maltase and is thereby converted into dextrose.
- (3) *Lactose*. Lactose, sometimes called milk sugar, is the form of sugar that is present naturally in milk. Lactose has good food value and aids in producing crust color in baked products. It is very low in sweetening power and is not fermentable by baker's yeast.

b. Complex Sugars. Complex sugars are those sugars that must be broken down into simple sugars before they can be acted upon by yeast. Sucrose, maltose, and lactose are the three complex sugars of interest to the baker.

- (1) *Sucrose*. Sucrose is composed of equal parts of dextrose and fructose and is commercially extracted from sugar cane and sugar beets. The use of sucrose in yeast doughs serves two primary functions: It provides carbohydrates for yeast fermentation, and it contributes sweetness to the finished baked product. In a yeast dough, sucrose is split into its primary components (dextrose and fructose) by the enzyme invertase, which is derived from yeast. The yeast digests the simple sugars (dextrose and fructose) to develop carbon dioxide gas and alcohol.

47. Storage

a. General. When storing all types of sugar, observe the following rules:

- (1) Store sugar in closed containers in the storage room with other dry ingredients.
- (2) Keep the storage area dry and well ventilated because sugar readily absorbs moisture. When sugar is dry, it is not affected by low temperatures or by temperatures up to 150° F.
- (3) Store sugar apart from oil, turpentine, paints, and similar items, because sugar absorbs foreign odors.
- (4) Keep the storage area reasonably cool, clean, and as rodent-and insect-proof as possible.
- (5) Store sugar on dunnage or shelves according to the size of the container.

b. Prevention of Caking. Sugar crusts if it becomes damp or if it is moved from an atmosphere of high humidity to one of low humidity. Sugar that has been exposed to such conditions should be restacked every day for several days to prevent caking.

Section IV. LEAVENING AGENTS

48. Leavening Methods

The doughs and batters from which pastry products are made are lightened, or caused to

rise, by leavening. Leavening incorporates tiny bubbles of gas in the dough or batter; during the baking process the dough or batter bakes

around these bubbles, creating a light and spongy texture. Leavening methods are classified as physical, chemical, or biological, depending on the manner in which gas is incorporated in the mixture.

a. Physical. In the physical method of leavening, air is incorporated in the batter by whipping or beating. Another source of physical leavening is the expansion of moisture in the batter, which is caused by oven heat.

b. Chemical. In the chemical method of leavening, carbon dioxide gas comes from baking soda.

- (1) *Baking soda with acid.* Baking soda is combined with an acid substance such as sour milk, buttermilk, vinegar, or molasses. Gas is released from the soda by the edible acid.
- (2) *Baking soda in baking powder.* Baking powders contain baking soda and one or more acid-reacting substances usually in a ratio of two parts acid to one part soda.

c. Biological. In the biological method of leavening, gas is produced by yeast.

49. Baking Soda

a. Use. The amount of baking soda required in a recipe depends on the acidity of the milk or other acid food used. Because the acidity of milk or other acid foods varies, the amount of baking soda to be used must be estimated. Approximately $\frac{1}{6}$ of an ounce of baking soda for 1 pound of milk is the general rule. The best way to use soda is to sift it with the other dry ingredients; the gas-producing action of soda begins to deteriorate as soon as the soda is mixed with a liquid. If too much baking soda is used, the product will have a disagreeable soapy flavor.

b. Storage. Soda should be stored in a dry place in an airtight container.

50. Baking Powders

When baking powder is used, the guesswork involved in combining soda with an acid is eliminated. Baking powders vary in their speeds of reaction because of the differences in the acid substances they contain.

a. Composition. The following ingredients are common to all baking powders.

- (1) *Soda.* Soda is a mild alkali.
- (2) *Acid-reacting material.* The acid-reacting material used in baking powders is tartaric acid or its acid salts; acid salts of phosphoric acid; compounds of aluminum, sodium aluminum sulphate, or calcium lactate; or a combination of these.
- (3) *Neutral stabilizer.* Starch or starch and food calcium are used to stabilize baking powders. Both ingredients increase the food value of the product.

b. Storage. Nearly all baking powders deteriorate with age; they are likely to absorb moisture or to become caked and lumpy. Moisture causes them to release their gas and become useless; caked and lumpy baking powders are difficult to mix with flour. Only small quantities of baking powder should be stored. The containers should be as airtight as possible and should be stored in a dry place.

51. Yeast

a. General. Yeast is a one-celled microscopic plant that multiplies by a process known as budding. The enzymes in yeast cause the conversion of compound sugars to simple sugars and the conversion of these simple sugars to carbon dioxide gas and alcohol. The action of the carbon dioxide gas causes the dough to rise and thus give the proper form and texture to bread and rolls.

b. Growth. Yeast exists in either a vegetative stage or a spore stage. It must be in the vegetative stage before it can act as a leavening agent. When yeast plants are exposed to unfavorable growing conditions, such as the absence of moisture, the cells pass into the inactive, or spore, stage. When conditions again favor growth, yeast spores return to the active, or vegetative, stage. The growth of yeast is affected by certain chemicals and by temperatures.

- (1) *Chemicals.* Sodium chloride (table salt) retards yeast activity. Sulphates and phosphates promote yeast activity.

- (2) *Temperatures.* Yeast thrives at temperatures between 78° and 90° F. At temperatures below 78° F., yeast growth is retarded; at temperatures below 50° F., the growth nearly ceases. Yeast is killed by a temperature of approximately 140° F.

the interior. Compressed yeast requires refrigerated storage; the ideal storage temperature is about 45° F.

c. Types. Two commercial types of yeast prepared from manufactured yeast plants are discussed below. Active dry yeast is the type procured by the Armed Forces.

d. Leavening Action. The leavening action of yeast is due to the presence of enzymes, substances in the yeast which are necessary to cause certain chemical and physical changes in other substances but which are not affected themselves. Each class of enzymes will cause one particular chemical conversion. The functions of the most important enzymes in yeast are covered below.

- (1) *Active dry yeast.* Active dry yeast (granular dehydrated yeast) is prepared by dehydrating active yeast cells. Approximately 8 percent of the moisture remains in the yeast cells after dehydration. When dehydration is complete, the cells are shaped into small pellets and packed in hermetically sealed cans. This type of yeast has more leavening power per unit of weight and volume than compressed yeast; therefore, only half as much is required. Active dry yeast may be stored for long periods of time at moderate temperatures.
- (2) *Compressed yeast.* Compressed yeast is prepared from manufactured yeast cells by progressively cooling, filtering, and compressing large numbers of the cells. This compressed mass, containing about 70 percent moisture, is cut into sizes suitable for bakery use. Compressed yeast ranges in color from a light cream to a light brown. A slight drying of the surface causes the surface to have a lighter tint than

- (1) *Invertase.* Invertase converts cane sugar, or sucrose, into a simple form of sugar known as invert sugar. This conversion is necessary before the sugar can be used by the yeast for fermentation.
- (2) *Maltase.* Maltase converts malt sugar, or maltose, into dextrose, which is then fermentable by yeast.
- (3) *Zymase.* Zymase, the specific fermenting enzyme in yeast, converts invert sugar, dextrose, and fructose into carbon dioxide gas and alcohol. Carbon dioxide gas is necessary for raising the dough.
- (4) *Protease.* Protease converts some of the proteins, which cannot dissolve in water, into a form that will dissolve in water. In this form the proteins can be used by yeast as food. Protease also softens or conditions the gluten. This action is more pronounced when yeast cells are dead or dying.

Section V. SHORTENINGS

52. General

Baked goods that are tender and have a soft velvety crumb are described as "short," and the fats and oils used principally to produce this pleasing quality are known as shortenings. The shortenings used for baking purposes are of either vegetable or animal origin. The dividing line between fats and oils is not very definite. In general, shortenings that are fluid at room temperature are called oils, and those that are

solid at room temperature are called fats. Fats are classified as hard and soft, depending on their melting point. Most solid shortenings used at the present time are mixtures of hard and soft fats.

53. Composition

Although shortenings may vary in consistency, melting point, and other physical properties, they are similar in chemical composition.

All commonly used shortenings contain, in varying amounts, the chemicals listed below.

a. Stearin. Stearin is a natural hard fat of animal origin. Vegetable stearin may be obtained by saturating vegetable oils with hydrogen gas.

b. Palmitin. Palmitin is a fat obtained from both animal and vegetable sources.

c. Olein. Olein is an oil obtained from both animal and vegetable sources.

d. Linolein. Linolein is an oil present in cottonseed oil.

54. Classifications

Shortenings may be divided into three classes: animal fat, vegetable, and blended.

a. Animal Fat Shortening. Fat or oil produced from the fatty tissues of animals is called animal fat shortening. It may be produced by rendering—that is, by heating the fatty tissue until the fat separates from the connecting tissue. The resulting shortening may be used in this unrefined state; or it may be further processed by filtering, refining, and bleaching.

(1) *Lard.* Lard is made by rendering the fatty tissue obtained from hogs. The different types of lard are governed by the part of the hog from which the fat is procured and by the process that is used for rendering and cooling the fat. Packing the rendered fat while it is hot and then allowing it to cool causes the harder parts to solidify and separate from the softer parts. Chilling the rendered fat quickly by mechanical means prevents the separation of the hard and soft parts and produces a smooth lard. Smooth lard is preferred because of its desirable consistency.

(2) *Butter.* Butter, though not rendered by heat, is of animal origin. Butter is the fat of milk separated from milk or cream by churning. In accordance with U.S. Government standards, butter must contain not less than 80 percent milk fat. The remainder of butter is made up of water, together with a small amount of casein (milk

protein), salt, milk sugar, and certain substances that give butter its characteristic flavor. Because of its composition and low melting point, butter is easily digested and, like other edible fats, is a concentrated fuel food for the human body. The use of butter in cake batters is limited to low sugar-to-flour ratio cakes because of its poor emulsification properties and lack of uniformity. When butter is used in place of shortening in a low sugar-to-flour ratio cake, more butter must be used to keep the fat content of the formula at the proper level. The water content of the formula and the amount of salt used must be reduced. To determine the amount of butter to use, divide the amount of shortening in the recipe (for example, 10 pounds) by 80 (percentage of fat in butter); then multiply the answer by 100.

Example: $10 \div 80 = .125$.

$.125 \times 100 = 12.5$ pounds of butter required. To determine the amount of water that must be subtracted from the recipe, multiply 12.5 (pounds of butter required) by 16 percent (approximate percentage of water in butter).

Example: $12.5 \times .16 = 2$ pounds of water that must be subtracted from the recipe.

b. Vegetable Shortening. Vegetable shortening is obtained from the seeds (for example, cottonseeds) or the meat (for example, coconut) of oil-bearing plants. The crude vegetable oil is extracted by pressing the meat or seeds while they are hot or by using chemical solvents. The crude oil must be refined, filtered, and deodorized before it is edible.

(1) *Vegetable oils.* While vegetable oils, such as those pressed from corn, coconut, peanuts, soya, and cottonseeds, are not issued in the United States for use in baked goods, conditions sometimes make their use necessary in oversea areas.

(2) *Hydrogenated shortening.* Edible oils may be successfully changed into solid fats by a chemical process known as

hydrogenation. The consistency of the finished product is controlled by the quantity of hydrogen gas incorporated in the oil. If a vegetable oil is completely hydrogenated, the oil will change into a fat too hard to use as shortening. So that the product will have the proper consistency (the consistency of lard), the vegetable oils are only partly hydrogenated. For best results, hydrogenated shortenings should be used at temperatures between 70° and 80° F.

c. Blended Shortening. Blended shortening is made by blending edible oils and fats in such proportions that the finished product has a plastic consistency comparable to that of lard. All blended shortenings are refined, bleached, filtered, and deodorized before they are chilled and packaged. Parts of the fats and oils are hydrogenated so that they will be hardened to the proper consistency.

d. Bakery Type Shortening Compound (Emulsifier). Shortening that is produced especially for use in cakes having a high sugar content contains emulsifying agents. This type of shortening is known as emulsified, or high-ratio, shortening. Its function is explained in paragraph 80e.

55. Storage

Shortening is usually packed in tin or other nontransparent containers. Antioxidants are added to some shortenings to prolong their keeping qualities. If the shortening is to be stored for several months, the storage area should be dry and at a temperature of 35° to 40° F. When small stocks are kept for immediate use, the storage area should be dry and at a temperature of 50° to 70° F. Because shortenings become rancid with age, stocks should be examined before they are used. Proper storage conditions and stock rotation are the best guards against rancidity.

Section VI. MILK

56. General

The word "milk," unless qualified, means the liquid whole milk that is obtained from cows. Milk in its original state will not retain its freshness very long; therefore, for purposes of prolonging its keeping qualities and facilitating handling and storage, milk is packed in various concentrated forms. Examples are evaporated whole milk, dry whole milk, and nonfat dry milk. When handled properly, any of these forms of milk may be used in pastry making.

57. Types

a. Liquid Whole Milk (Fresh Milk). Liquid whole milk is composed of approximately 88 percent water, 8.5 percent nonfat solids, and 3.5 percent milk fat. Liquid whole milk must be obtained from an approved source, handled in accordance with standards of the Armed Forces, and pasteurized in approved pasteurization equipment. Fresh milk is seldom used in baking because it is difficult to handle and preserve.

b. Evaporated Whole Milk. Evaporated whole milk is prepared by evaporating 15 to 20

percent of the water from liquid whole milk. It contains approximately 8 percent milk fat, 20 percent nonfat solids, and 72 percent water. Sweetening is not usually added. Evaporated whole milk is hermetically sealed in metal cans for commercial distribution.

c. Dry Whole Milk. Dry whole milk is a powdered or flaked product obtained by removing practically all of the water from the milk, leaving the dry milk solids intact. Dry whole milk contains approximately 1.5 percent moisture, 26.5 percent milk fat, and 72 percent nonfat solids.

d. Nonfat Dry Milk. Nonfat dry milk is the product resulting from the removal of fat and water from milk. It contains lactose, milk proteins, and minerals in the same proportions as those found in the fresh milk from which it is made. It contains approximately 1.5 percent moisture, 1.5 percent fat, and 97 percent nonfat solids. Because most of the butterfat is removed before drying, nonfat dry milk possesses keeping qualities superior to those of dry whole milk.

58. Storage

a. Keep fresh milk in refrigerated store-rooms at temperatures between 34° and 40° F.

b. Store evaporated milk in sheltered storage rooms. Turn cases upside down every 30 to 60 days to prevent separation of the butter fat.

c. Store dry milk in a clean, dry place that is free of odors. Place the containers on dunnage and keep them tightly closed so that the milk will not become moist or lumpy. Under these conditions nonfat dry milk will keep for at least 6 months; however, stocks should be kept small and should be replaced when necessary so that there is less likelihood that off-flavors will develop.

Section VII. EGGS

59. General

Eggs are an important ingredient of cakes and sweet goods. They contribute color and nutritive value; because of their high protein and moisture content, they serve as structure builders in cakes. Fresh, frozen, and dried eggs, if handled properly, are equally acceptable for use in baked goods. Whole eggs or the separated whites and yolks may be used.

60. Composition

a. *Egg White*. The white of a fresh egg is about seven-eighths water and one-eighth protein (chiefly albumen). There is only a trace of fat in the white. The white generally constitutes about two-thirds of the weight of the edible portion of the egg.

b. *Egg Yolk*. The yolk has a higher nutritive value than the white. The yolk contains vitamins A and D, thiamin, riboflavin, calcium, phosphorous, and iron. One-third of the yolk is fat, one-half is water, and the remainder is made up of proteins and mineral matter.

c. *Egg Shell*. The egg shell is porous and has a protective coating called the bloom. The coating should not be washed off because its absence will allow odors, flavors, bacteria, and molds to be absorbed through the shell; as a result, the egg can easily spoil.

61. Methods of Preservation

Eggs are highly perishable and, unless kept under proper conditions of sanitation and storage, may in a relatively short time become inedible. There are several ways of preserving eggs so that periods of high and low egg production will not affect their availability and price on the market.

a. *Cold Storage Eggs*. Cold storage eggs are eggs that are preserved by storing in rooms having controlled humidity, temperature, and air circulation. These eggs are usually stored at temperatures of 29° to 31° F. Eggs to be preserved by the cold storage method must be fresh and of high quality.

b. *Frozen Eggs*. Frozen whole eggs (which have been removed from the shells), frozen egg whites, and frozen egg yolks generally are available in convenient 10- and 30-pound cans. Since it is practically impossible to separate all of the white from the yolk, frozen egg yolks will contain a trace of egg whites.

c. *Dried Eggs*. Dried eggs are produced by removing the bulk of the moisture from liquid eggs. This is accomplished by either a spray-drying or a drum-drying process. Dried eggs usually are available as dried whole eggs, dried yolks, or dried whites (albumen). Dried eggs may be used successfully in most pastries requiring eggs; however, their use in sponge cakes is not recommended. Depending on the instructions in the recipe, dried eggs are either sifted with the dry ingredients or reconstituted before use in accordance with directions supplied by the manufacturer.

62. Handling of Frozen Eggs

Frozen eggs are delivered in a solid frozen mass at a temperature of about 15° F. It is important that eggs be thawed, thoroughly mixed, and weighed before they are used in a recipe. They may be thawed in the refrigerator, or the can containing the eggs may be placed in cold running water. Frozen eggs, once thawed, are very perishable and must therefore be stored in as cold a refrigerator as possible.

Once frozen eggs have been thawed, they should not be permitted to refreeze.

63. Storage

a. Fresh Eggs. Fresh eggs are stored in the cases in which they are received. They must be kept under refrigeration until they are to be used.

b. Frozen Eggs. Frozen eggs are received in cans and should be kept in the cold storage warehouse until they are to be thawed for use.

c. Dried Eggs. Dried eggs are received in sealed containers and may be stored on the shelf until they are to be used.

Section VIII. OTHER INGREDIENTS

64. Salt

The salt used in pastry preparation is chemically known as sodium chloride but is commonly referred to as table salt. It is used in pastry products because of its ability to improve the flavor of all foods and to intensify the flavors of the other ingredients. Salt also has another important function in yeast-raised doughs (par. 106*d*). Salt should be stored in a clean dry place where it can be kept free from dust and moisture.

65. Flavoring Agents

For every type of pastry product, there is a flavoring or spice that is more appropriate than any other. Although flavoring cannot be considered a basic ingredient of pastry, it is important because it produces the desired flavor in the finished product.

a. Flavoring Extracts and Emulsions. Flavoring extracts usually are alcoholic solutions of the natural oils and other substances contained in the actual item. Lemon and vanilla are the most commonly used extracts. Flavoring emulsions are prepared by combining or emulsifying the natural oils and other substances containing the flavoring with a certain amount of water and gum. Lemon is also wide-

ly used in emulsion form. Flavoring extracts and emulsions should be stored in closed containers in a clean, dry place for periods not to exceed 90 days. Improper storage results in evaporation, rancidity, and loss of flavor. In emulsions, improper storage can also result in a breakdown of the water and oil.

d. Dried Spices. Spices are made from the roots, rhizomes, seeds, fruits, buds, or bark of certain flavor-producing plants. The principal spices are cinnamon, cloves, mace, allspice, nutmeg, and ginger. Spices should be kept in tightly sealed containers. When exposed to air they quickly lose their flavor.

c. Cocoa and Chocolate. Cocoa and chocolate are in the spice class although they are not generally considered in this category. The chief difference between cocoa and chocolate is that the natural fat, cocoa butter, is partially removed from cocoa before the cocoa is powdered. It is possible to substitute one of these items for the other if appropriate adjustments are made in the shortening content of the formula (app. IV). Cocoa and chocolate should be stored in a clean, cool, dark place. Heat and light will cause deterioration. Storage in an airtight container will lessen the rate of deterioration and prevent these items from picking up foreign odors.

PART TWO

PRODUCTION OF PASTRY ITEMS

CHAPTER 5

PIES

Section I. INTRODUCTION

66. General

A quality pie depends on two things: a proper filling and a tender crust. Pies may be the double-crust type, the one-crust (custard) type, or the prebaked-shell type. Fillings used in double- and one-crust (custard) pies are baked

in the crust at the same time the crust is baked. Fillings used in prebaked-shell pies are pre-cooked and then placed in the shells. Pies prepared in prebaked shells are often topped with meringue or whipped topping. Figure 12 illustrates the three types of pies.

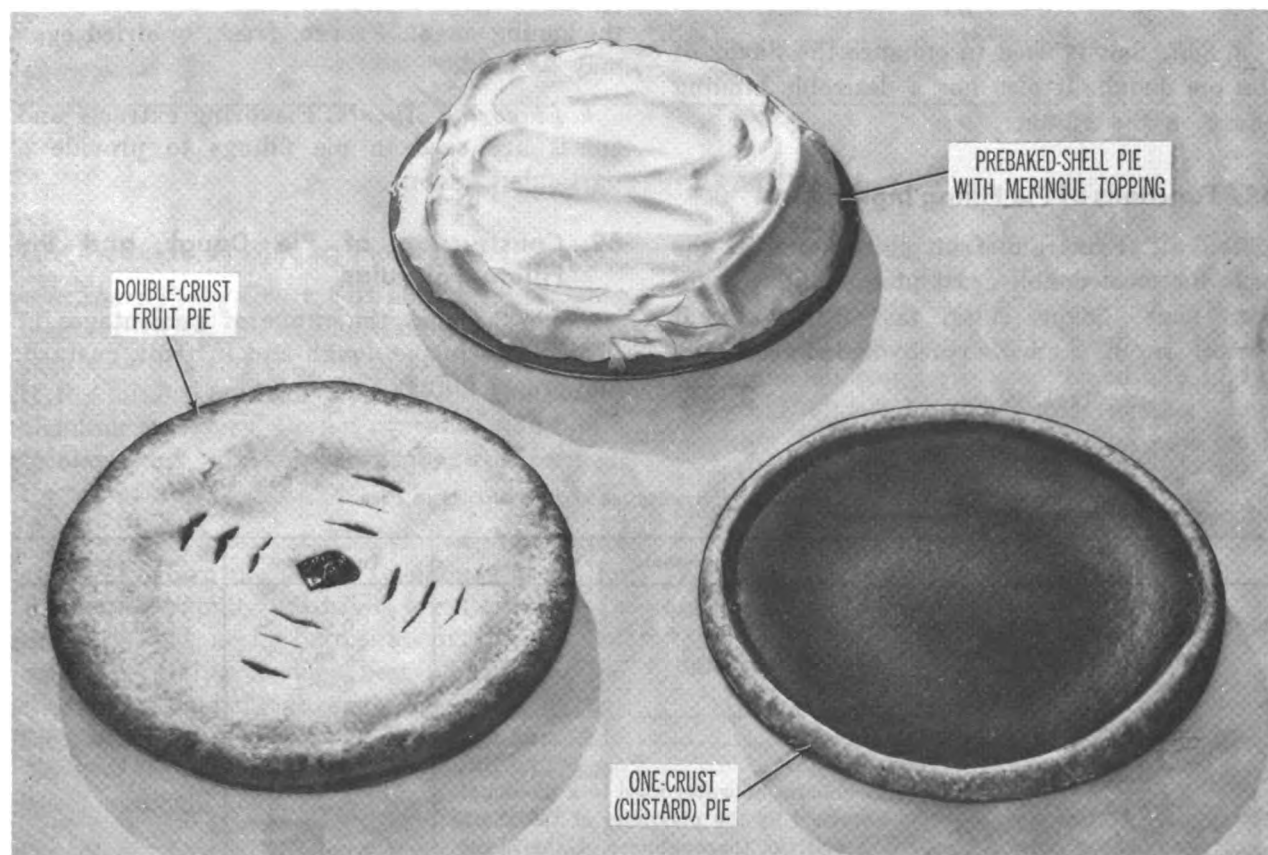


Figure 12. Three types of pies.

67. Functions of Pie Dough Ingredients

a. Flour. Flour is the chief structure builder in pie dough. Hard wheat flour, soft wheat flour, or a blend of the two may be used. A blend of 60 percent hard flour and 40 percent soft flour will produce a better crust than will all hard flour or all soft flour. If all soft wheat flour is used, less shortening is required.

b. Water. Water dissolves the salt, develops the flour protein, and determines the consistency of the dough. Chilled water should be used because warm water has a tendency to melt the shortening and destroy the flake. If too much water is used, the crust will be tough and will shrink. If not enough water is used, the dough will be dry and difficult to handle.

c. Shortening. Shortening produces tenderness in the crust by coating the flour particles and preventing excess gluten development. It also improves the keeping quality of the finished product. Because of its plasticity, hydrogenated shortening is desirable for use in pie dough; however, any shortening may be used.

d. Salt. Salt is used to enhance the flavor of the pie dough. It also has a desirable binding effect on the gluten.

68. Functions of Pie Filling Ingredients

a. Fruit. Fruit and fruit juice serve as the base for most double-crust pies. Fruit contributes body, flavor, color, taste, and aroma. Fresh, frozen, canned, or dehydrated fruit may be used.

b. Sugar. Sugar is used to increase the palatability, body, and character of the filling.

c. Water. Water dissolves the sugar, gelatinizes the starch, and forms the body of the filling.

d. Salt. Salt brings out the flavor of the other ingredients in the filling.

e. Starch. Cornstarch or cold water starch is used to thicken pie filling to the proper consistency for handling and eating. Cold water starch (par. 72) is used in fruit pie filling. Cornstarch is used in fruit pie filling when cold water starch is not available and in cream filling.

f. Milk. Milk provides flavor and nutritional value in cream, custard, pumpkin, and specialty fillings. Whole, skimmed, evaporated, or dry milk may be used.

g. Eggs. Eggs are used in custard, cream, and chiffon fillings. The eggs contribute quality, flavor, and color, and act as a thickening agent. In custard pies, eggs are the chief thickening agent. Frozen, fresh, or dried eggs may be used.

h. Flavoring Agents. Flavoring extracts and spices are used in pie fillings to provide a particular flavor.

69. Construction of Pie Dough and Pie Filling Formulas

Table 3 shows the range of percentages of ingredients in pie dough and in fruit, custard, and cream fillings.

Table 3. Range of Percentages of Ingredients in Pies

Item	Ingredients	True percent	Baker's percent
Pie Dough -----	Sugar -----	0 to 3	0 to 10
	Salt -----	½ to 1	3 to 4
	Milk Solids -----	0 to 2	0 to 5
	Shortening -----	24 to 32	50 to 75
	Flour -----	44 to 50	100
	Total moisture -----	15 to 24	20 to 50
	(The amount of water used in a pie dough is governed by the plasticity of the shortening and the thoroughness of the blending.)		

Table 3. Range of Percentages of Ingredients in Pies—Continued

Item	Ingredients	True percent	Baker's percent
Fruit Filling -----	Sugar -----	15 to 25	
	Salt -----	0 to $\frac{1}{4}$	
	Starch, edible -----	3 to 4	
	Fruit -----	35 to 50	
	Juice and water -----	30 to 45	
	Butter or margarine -----	0 to $1\frac{1}{2}$	
	Total moisture -----	30 to 45	
Custard Filling -----	Sugar -----	16 to 20	
	Salt -----	$\frac{1}{8}$ to $\frac{1}{4}$	
	Eggs or yolks -----	10 to 20	
	Milk solids -----	5 to 8	
	Cornstarch -----	0 to $1\frac{1}{2}$	
	Spices -----	$\frac{1}{8}$ to $\frac{1}{2}$	
	Butter or margarine -----	0 to $1\frac{1}{2}$	
	Pumpkin -----	28 to 36	
	Total moisture -----	32 to 54	
Cream Filling -----	Sugar -----	15 to 25	
	Salt -----	$\frac{1}{8}$ to $\frac{1}{4}$	
	Eggs or yolks -----	10 to 14	
	Milk solids -----	0 to 10	
	Chocolate -----	5 to 7	
	Cocoa -----	3 to 4	
	Cornstarch -----	4 to 5	
	Butter or margarine -----	0 to 3	
	Fruit juices and rind -----	$4\frac{1}{2}$ to $6\frac{1}{2}$	
	Total moisture -----	48 to 52	

Section II. PREPARATION

70. Methods of Mixing Pie Dough

a. Short Flaky Crust. Sift all dry ingredients together twice. Blend shortening and dry ingredients to about the size of small dried peas. If the mixing machine is used, use the pastry blending accessory. Do not overmix. Add liquid to above and mix only until dough is formed. Do not overmix.

b. Long Flaky Crust. Use chilled ingredients and a standard pie dough formula. Cut in the shortening rapidly until it is evenly divided in the mix and is in lumps about the size of marbles. Mixing is done best by rubbing the shortening particles through the hands so that they are flattened between lays of flour. Add the water quickly but do not overmix because the dough will toughen.

c. Mealy Crust. A mealy crust results when

the shortening is so soft that it is partly liquefied during mixing. Use a standard formula and as little water as possible. Oil or semi-liquid shortening may be used in this mix. If regular shortening is used, blend half of the flour and all of the shortening together thoroughly. Add the remaining flour and mix slightly; then add the water and mix only enough to bring the dough together.

71. Methods of Rolling Dough

a. Hand Rolling. Roll pie crust dough by hand as follows:

- (1) Flour the board, table, or other work surface lightly with hard wheat flour. (Hard wheat flour should be used for dusting because it flows smoothly and does not form lumps; soft wheat flour



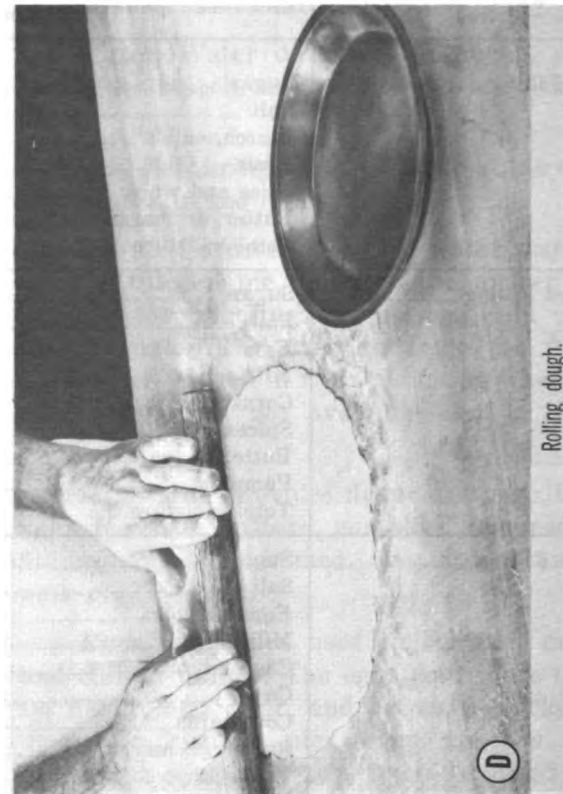
Cutting dough mass into large pieces.



Rolling large piece into a cylinder.



Scaling dough.



Rolling dough.

Figure 13. Method of rolling dough by hand.

does not dust smoothly and forms lumps which may cause spots in the crust).

- (2) Cut the dough mass into large pieces as shown in A, figure 13.
- (3) Roll each large piece of dough into a cylinder (B) and then cut it into smaller pieces and scale (C). Use 7 to 8 ounces of dough for bottom crust and 6 to 7 ounces for top crust. The dough should not be kneaded or patted and should have no cracks around the edges. Overhandling the dough will cause the crust to be tough or to shrink. If the dough ball divider is used, properly scaled and rolled dough balls will be formed.
- (4) Roll the ball of dough from the center to the edge, then back across the entire piece. Then roll the dough at a right angle to the first line of direction (D).
- (5) If the dough begins to stick to the

bench or roller (that is, does not spread out from the center when rolled), loosen it with a pastry scraper or spatula. If the dough should be turned over during the rolling process, there is danger that too much flour will be rolled into it and that the surface will not be smooth.

- (6) Roll top and bottom crusts $\frac{1}{8}$ inch thick. The diameter of the top crust should be 2 inches greater than the diameter of the top of the pie tin; the diameter of the bottom crust should be 4 inches greater.

b. Machine Rolling. Dough which is to be machine rolled should be rather firm. The dough should be mixed in advance and chilled slightly. Before dough is machine rolled, it must be scaled either by hand or with a dough ball divider. The pieces of dough are run through two sets of rollers, and the dough emerges in pieces that are of the desired diameter and thickness (fig. 14).

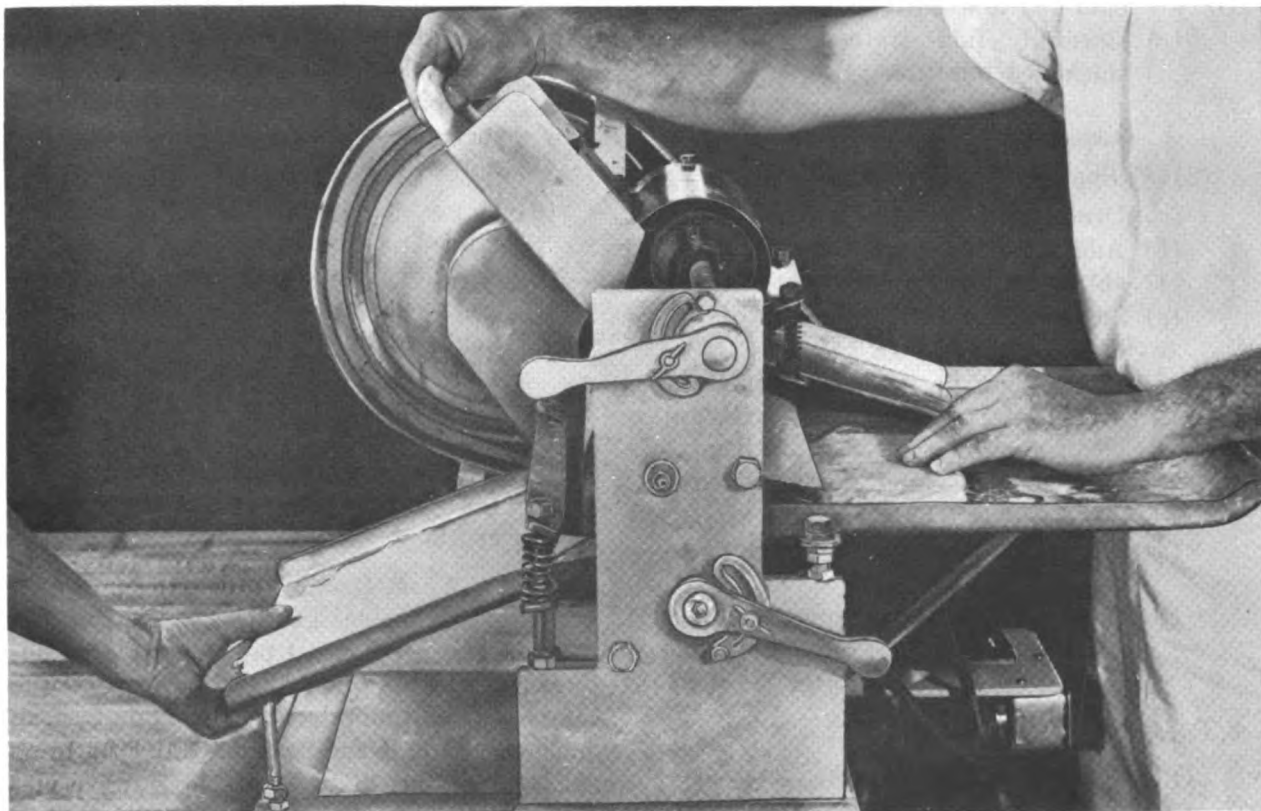


Figure 14. Rolling dough by machine.

72. Double-Crust Pies

a. Preparation of Filling. The use of pre-cooked cold water starch in the production of fruit pies has a number of advantages. A batch of filling can be prepared in minutes as opposed to the hours normally required to cook and cool conventional fruit fillings. Since no cooking is required, there is no loss through evaporation; and 6 to 12 percent more filling per batch is produced. The method of preparing fillings made with cold water starch is outlined in (1) below. The method of preparing fillings made with cornstarch ((2) below) is included here for the use of pastry cooks in messes and central pastry kitchens where cold water starch is not available.

(1) *Fillings made with cold water starch.*

- (a) Drain fruit.
- (b) Add water to juice if necessary to obtain the required volume.
- (c) Blend all dry ingredients (starch, sugar, spices, etc.) thoroughly in a dry mixing bowl.
- (d) Add juice gradually to dry ingredients and mix until smooth.
- (e) Carefully fold drained fruit into thickened mixture.

Note. Pies are less likely to boil during baking if the filling is chilled prior to use.

(2) *Fillings made with cornstarch.*

- (a) Drain fruit.
- (b) Add water to juice if necessary to obtain required volume.
- (c) Suspend starch in a portion of the liquid.
- (d) Bring main portion of the juice to a boil, stir in suspended starch, gelatinize starch, and cook until mixture is thick and clear. Remove from heat.
- (e) Add sugar and stir to dissolve the sugar.
- (f) Pour cooked mixture over drained fruit and blend carefully. Chill filling before putting it in the pie shell.

b. Panning.

- (1) Roll dough for bottom crust to dimensions specified in paragraph 71a(6).
- (2) Fold the dough in half to form a

semicircle. place the curved side of the fold 2 inches beyond the edge of the pie tin. Dough that has a tendency to break may be rolled onto the rolling pin and then be unrolled into the pie tin.

- (3) Unfold the top half of the dough toward the opposite side of the pan. When the dough is spread across the pan, it should extend 2 inches beyond the edge of the pan all the way around.
- (4) Press the dough to the bottom and sides of the pan; remove all air bubbles between the crust and the pan.
- (5) Dampen the bottom crust along the rim of the pan with water or with a mixture of egg and water (A, fig. 15).
- (6) Gently pour filling into the pan (B).
- (7) Fold half of the rolled dough for top crust (par. 71a(6)) over the other half; make several cuts (steam vents) along the fold (C).
- (8) Position the folded dough carefully over the filling (D). When the dough is unfolded it should completely cover the pie and extend approximately 1 inch beyond the edge of the pan. Do not stretch the dough.
- (9) Press the edges of the bottom and top crusts together to seal, and trim excess dough. Excess dough may be removed by pressing the palms of the hands against the rim of the pie tin (E). In central pastry kitchens, the pie trimmer rimmer (par. 18) can be used to good advantage. Scraps left from trimming may be worked into the dough being used for bottom crusts.

c. Use of Wash. Usually, a glazed surface on a pie is not desirable. The practice of washing the surface of a two-crust pie is considered unnecessary except when the top heat in the oven is poor and more crust color is desired, in which case a half-and-half mixture of beaten eggs and water may be used. However, it should be remembered that an egg wash will produce a varnished appearance which will de-

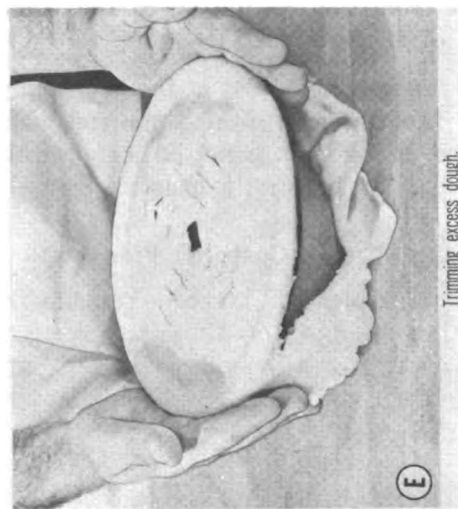
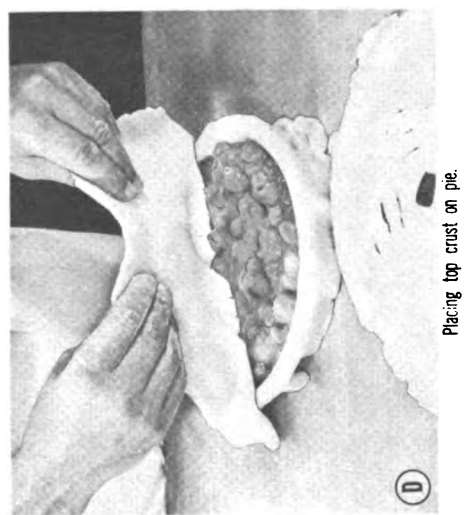
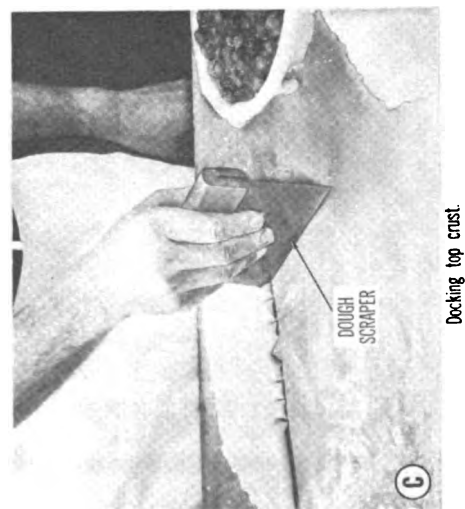
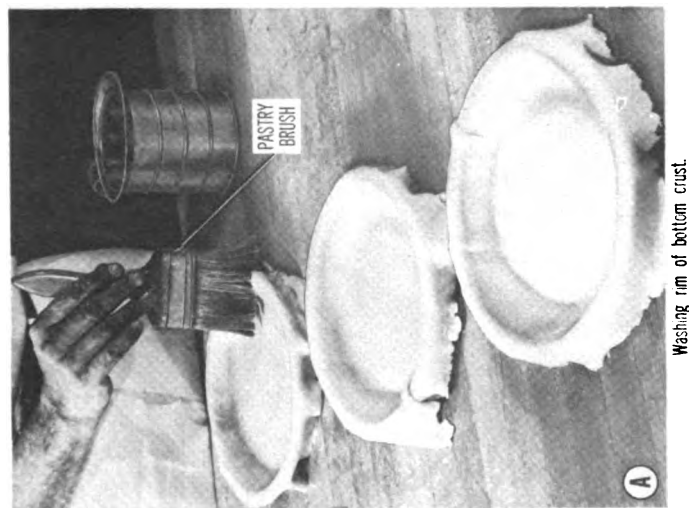


Figure 15. Preparation of double-crust pie.

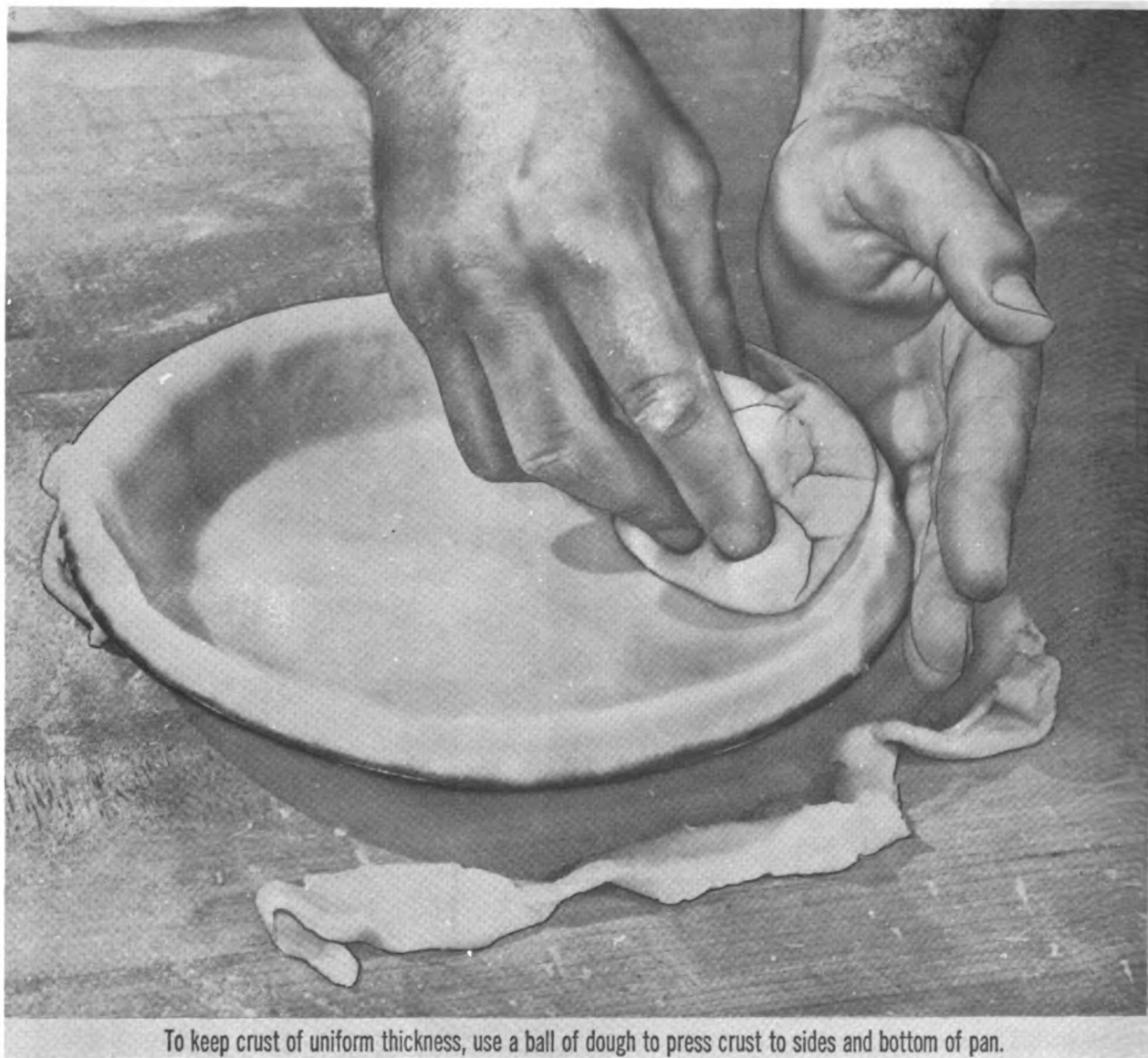
tract from the eye appeal of the "homemade" look of the product.

d. Baking. Bake pies at the oven temperature and for the length of time specified in the recipe. If the oven is not hot enough, the filling may boil out before the crust is properly baked.

73. One-Crust (Custard) Pies

Custard pies are not prepared during warm weather because of the danger of spoilage. Pan crust (fig. 16) as described in paragraphs 72b(1) through b(4). Build up the outer edge

of the crust and trim excess dough. When preparing custard pies, it is best to fill the shells after they have been placed in the oven (fig. 17). Start by putting a small amount of filling in each shell to keep the crusts from buckling; then finish filling the shells. Bake pies at the oven temperature and for the length of time specified in the recipe. If a pumpkin or custard pie is baked at too high a temperature or for too long a time, blisters may appear on the surface of the filling. Overbaking can also cause a custard pie to curdle or a pumpkin pie to crack.



To keep crust of uniform thickness, use a ball of dough to press crust to sides and bottom of pan.

Figure 16. Preparing shell for one-crust (custard) pie.

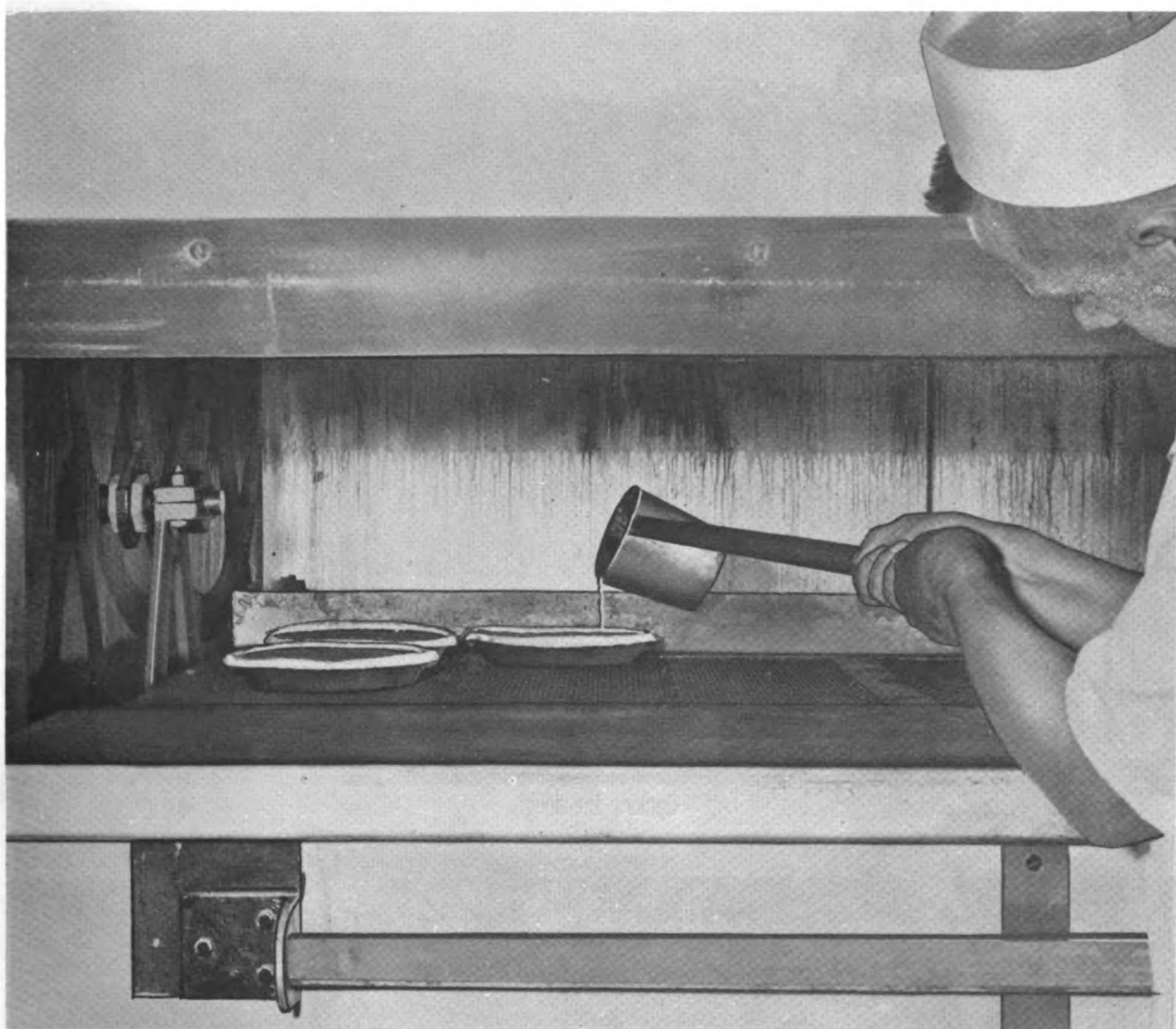


Figure 17. Filling unbaked pie shells.

74. Prebaked-Shell Pies

a. Preparation of Shell. To prepare shell, follow procedures described in paragraphs 72b(1) through b(4), except dock the dough (A, fig. 18) before placing it in the pan. This will keep the crust from developing blisters when it is baked. Trim off excess dough (B). Bake shell as specified in the recipe.

b. Preparation of Filling. Prebaked shells usually are filled with some type of cream filling. Cream fillings are prepared in the mess, not more than 3 hours ahead of serving time (par. 7b). Follow the mixing and cooking in-

structions given in the recipe. Overcooking will cause the filling to be too thick or to crack. Under cooking will cause the filling to be too thin. Pour the cooked filling directly into the baked shell (fig. 19).

c. Preparation of Meringue. Pies prepared in pre-baked shells are frequently topped with meringue. After the meringue has been spread over the pie (fig. 20), the pie is placed in the oven long enough for the meringue to brown. The methods of preparing meringue are described below. Be sure to use the correct proportions of egg whites and sugar and to use a bowl that is free of grease. Even the slightest

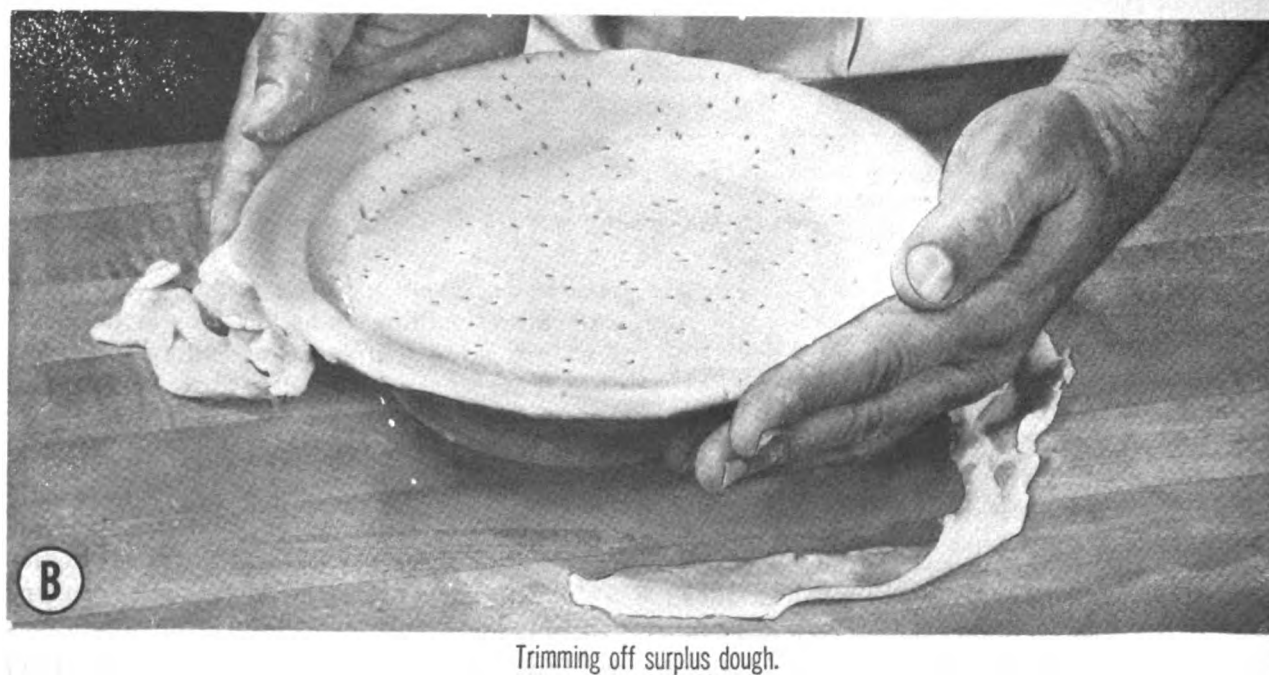
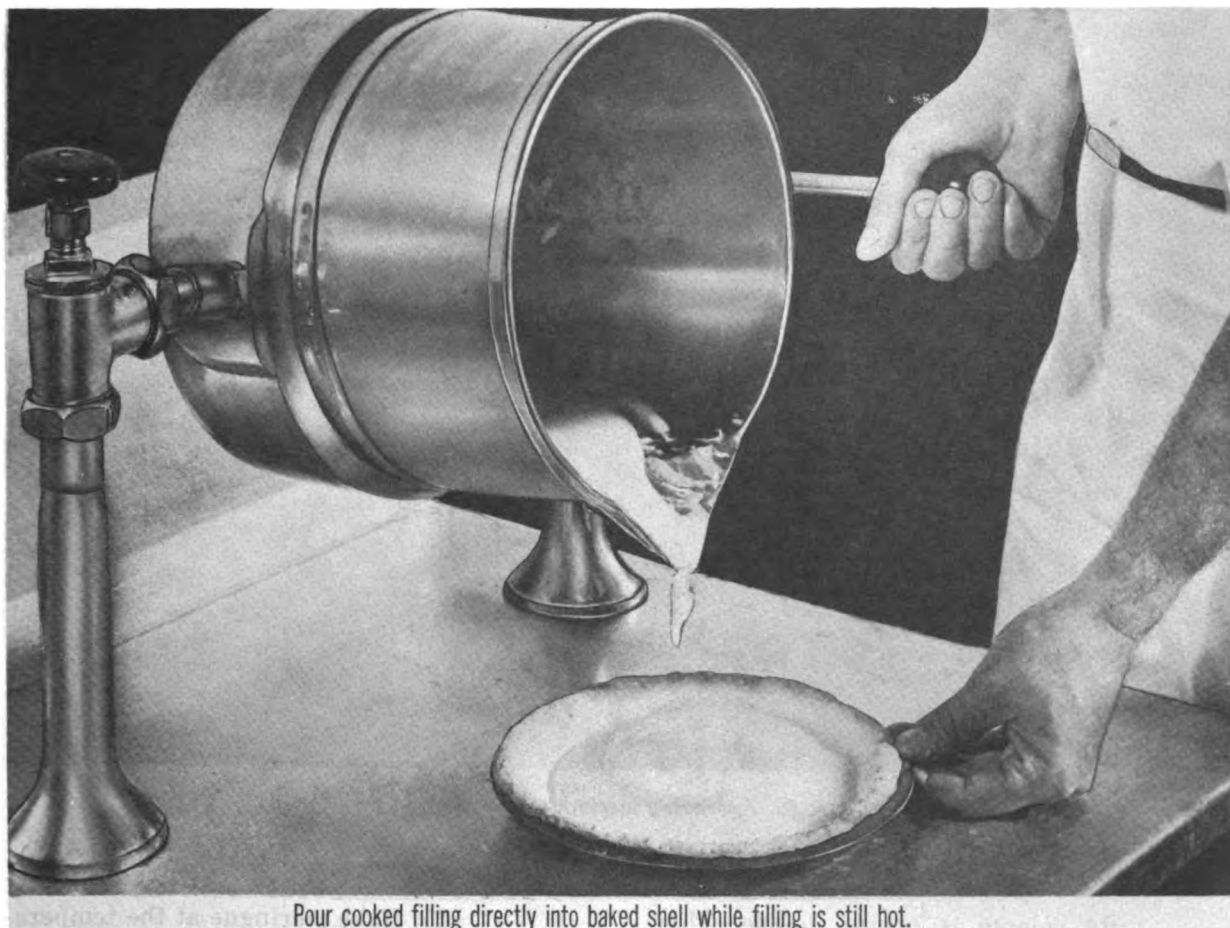


Figure 18. Preparation of prebaked pie shell.



Pour cooked filling directly into baked shell while filling is still hot.

Figure 19. Filling a cream pie.

trace of grease can keep the egg whites from whipping properly .

- (1) *Uncooked meringue.* Beat the egg white to a foam or wet peak and add the sugar gradually; continue beating until the mixture is smooth and will stand up in peaks when the beater is removed. Add flavoring. Bake meringue at the temperature specified in the recipe. If the oven is too hot, the meringue will be tough; if the oven is not hot enough, the meringue will shrink and dry out too much when it cools.

(2) *Cooked meringue.*

- (a) Made with hot sirup. This type of meringue is made in much the same way as uncooked meringue, but part of the sugar is replaced by sirup. Heat the sirup to 238° F., and pour it in a heavy thread-like stream into the egg whites as they are beaten at medium speed in the mixer. Continue to beat for approximately 1 minute after all of the sirup has been added. This type of meringue is not as likely to leak, crack, or shrink as uncooked meringue; and



Figure 20. Spreading meringue on cream pie.

its volume is nearly double. This type of meringue should be browned in a hot oven and used at once.

- (b) *Made with stabilizer.* Bring the main portion of the water to a boil. Suspend the cornstarch in the water held back for that purpose; add the suspended cornstarch to the boiling water and cook until thick and clear. Add sugar to cooked mixture and bring to a boil again. Remove from heat. Add salt to egg whites and beat until they are light. Pour cooked mixture over beaten egg whites while mixing at medium speed. Continue beating at medium speed until meringue peaks. Add vanilla to meringue and

stir. Bake meringue at the temperature specified in the recipe.

75. Criss-Cross Pies

For a criss-cross pie, prepare bottom crust as described in paragraphs 72b(1) through b(4) and gently pour fruit filling into the pie tin; then follow the steps shown in figure 21.

76. Turnovers

Turnovers may be prepared from pie dough or pie dough trimmings and fruit pie filling as shown in figure 22.

77. Faults in Pies

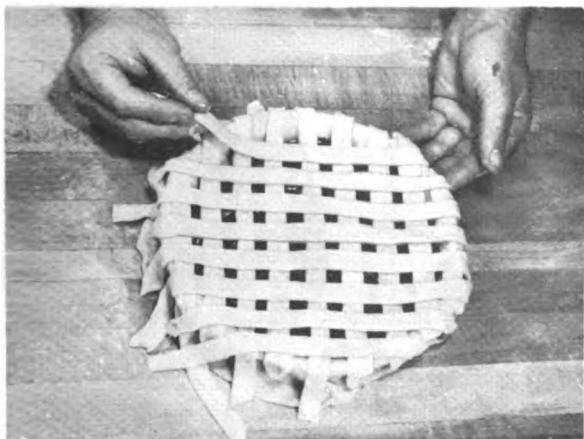
Table 4 lists faults that might occur in pie crusts, fillings, and meringue, together with



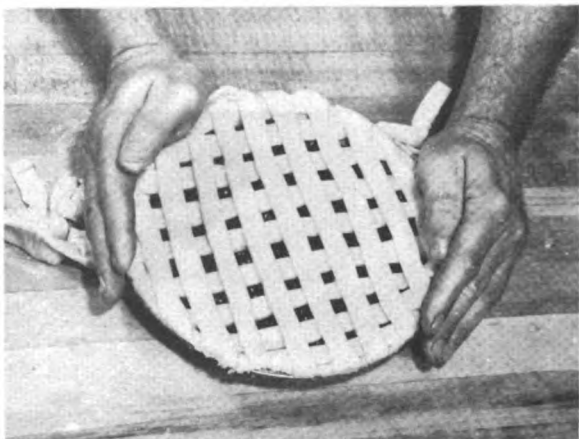
1. Roll dough for top to 1/8-inch thickness. Cut in strips approximately 3/4 inch wide.



2. Brush edge of bottom crust with water; then place strips of dough across pie.



3. Place second row of strips across pie at right angles to first row.



4. Trim excess dough.

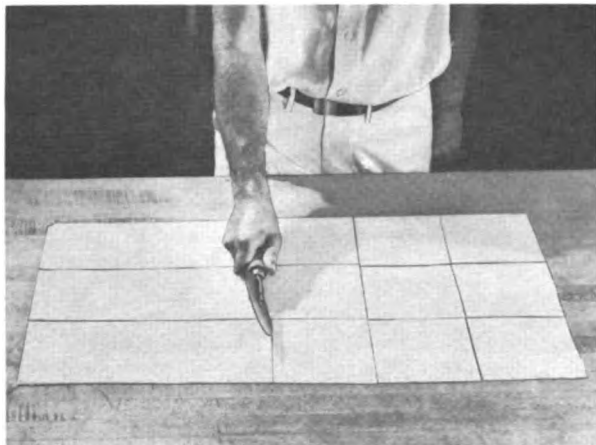
Figure 21. Preparing criss-cross pie.

possible causes of the various faults. The "Remarks" column gives some suggestions for correction of the faults; however, where the correction is obvious, this column has been left blank. For example, if the cause is "baking

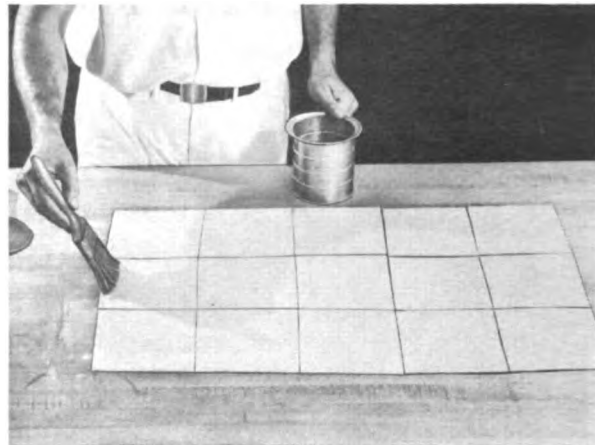
temperature too high or too low," the obvious correction is to bake the pie at the temperature prescribed in the recipe; or if the cause is "pan dirty or dented," the obvious correction is to use a pan that is clean and free of dents.

Table 4. Faults in Pies; Causes and Corrections

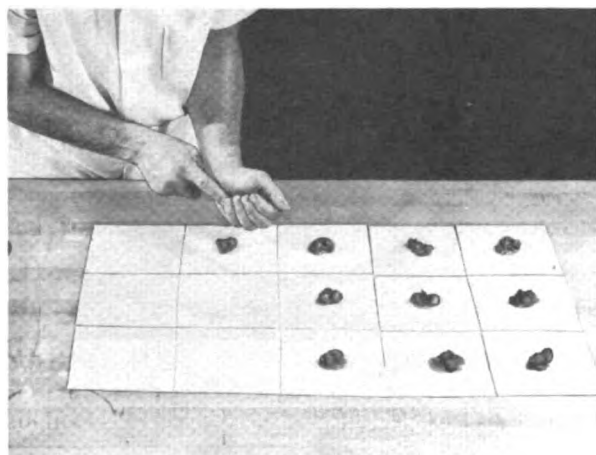
Faults	Causes	Remarks
CRUST:		
Shrinks excessively -----	Dough undermixed in first step, overmixed in final step, overworked, or stretched.	If dough has been rolled properly and excessive shrinkage still occurs, check recipe content, ingredient amounts, and oven temperature.
Is tough -----	Too much water; flour too strong; shortening too stiff; insufficient amount of shortening. Dough undermixed in first step, overmixed in final step, or overworked.	



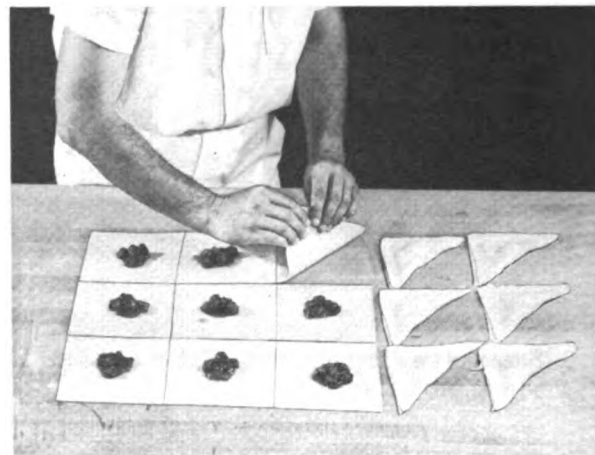
1. Cut rolled dough into 6-inch squares.



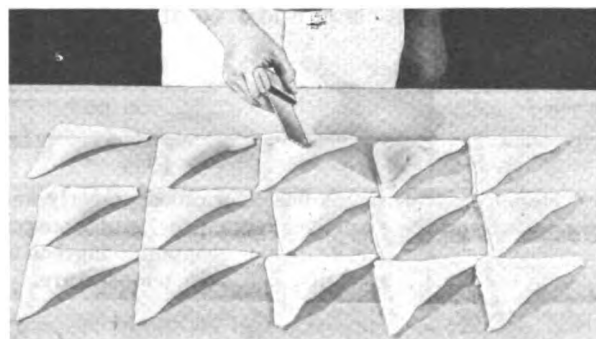
2. Brush edges of squares with water or milk.



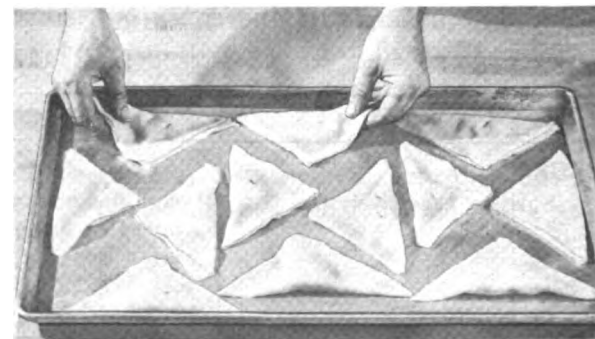
3. Place 4 ounces of pie fruit filling in center of each square.



4. Fold opposite corners of squares together and seal by crimping edges.



5. Dock top of each turnover to allow steam to escape; then brush with melted butter.



6. Place turnovers on sheet pan and bake as specified in recipe.

Figure 22. Preparing turnovers.

Table 4. *Faults in Pies; Causes and Corrections*—Continued

Faults	Causes	Remarks
Is not flaky -----	Shortening too soft.	Use chilled water and shortening of a firmer consistency; keep dough in cool place until it is used.
Is soggy -----	Flour and shortening rubbed excessively during mixing. Too much shortening; wrong type of flour. Use of fruit filling that is too hot or too thin.	To seal crust and keep it from absorbing liquid from the filling, wash shells with egg whites before baking. Make shells a day ahead of anticipated use and store in a clean, well-ventilated room to dry out.
Sticks to pie tin -----	Filling boils over. Pan new, wet, or dirty.	Heat oven to proper temperature.
Has raw spots -----	Dough improperly mixed or rolled; air bubbles between pan and dough. Dents in pan; uneven oven heat.	Mix any scrap dough and new dough thoroughly; press crust to pan.
Lacks color -----	Inadequate top heat in oven.	Color can be improved by adding up to 5 percent dry skim milk powder and about 3 percent sugar to formula. Egg wash may also be used. (see par. 72).
Prebaked shell draws up ---	Dough overmixed or too lean; scrap dough used; too much water.	
FILLING:		
Fruit boils out -----	Filling too hot or slightly fermented; too much filling. Oven too hot. Lack of holes in top crust.	Steam pressure may build up in a double-crust pie, with resultant loss of filling when crust breaks open.
Custard pie curdles -----	Use of milk that is about to sour. Pie overbaked.	
Pumpkin pie cracks -----	Too many eggs; lack of moisture. Pie overbaked.	
Pumpkin or custard pie blisters.	Pie overbaked; baked in oven that is too hot.	
Lemon or cream pie cracks..	Filling cooked too long. Filling contains too much starch, too many eggs, or too little butter or margarine.	
Filling has off-flavor -----	Use of improper ingredients; too much starch in filling. Improperly stored.	When it is necessary to add flavoring, be sure that it is of good quality and is used in proper proportion. Place filling in a clean container to preserve quality and freshness.
Filling breaks down -----	Filling cooled too slowly after cooking; not stirred often enough while cooking. Excess acidity in fruit filling.	Add more starch and, if possible, reduce acid.
Filling tastes flat or bland --	Filling lacks salt or fruit acids.	Recommended fruit acids are citric and tartaric.

Table 4. *Faults in Pies; Causes and Corrections*—Continued

Faults	Causes	Remarks
Fruit filling has poor color--		Do not allow fruit to stand exposed to air because it may oxidize. A small amount of vegetable coloring may be used to improve color of filling.
	Too much thickening.	
Filling too thin -----	Too little starch or too few eggs. Filling undercooked.	
Filling too thick -----	Too much starch, too little sugar, lack of juice or water. Filling overcooked (evaporation occurs).	
MERINGUE:		
Breaks down -----	Egg whites whipped in container with oily surface.	The slightest trace of grease may keep whites from whipping properly.
	Too much moisture in egg whites.	A small amount of cornstarch added to egg whites will absorb excess moisture.
	Egg whites underwhipped or underbaked.	
	Mix contains too much or too little sugar.	

CHAPTER 6

CAKES

Section I. INTRODUCTION

78. General

Cake is a baked batter made from flour, sugar, salt, leavening, shortening, milk, eggs, and flavoring; the ingredients are combined to produce a fluffy, fine-grained product. The general relationship of the ingredients that must be brought into balance differs according to the type of cake. Quality cakes depend on the use of ingredients of high quality, proper mixing and panning methods, correct batter temperature, correct baking time and temperature, and other similar factors. The three basic types of cakes are listed below.

a. Battery-Type Cakes. Batter-type cakes are made from a mix that contains a high percentage of shortening. Plain cake, white cake, gingerbread, spice cake, and fruit cake are examples.

b. Foam-Type Cakes. Foam-type cakes are made from a mix that contains no shortening. (Butter sponge cake is the exception.) Foam-type cakes are more difficult to make than batter-type cakes because proper texture and volume depend on the incorporation of air in the mix. Examples of foam-type cakes are angel food cake, sponge cake, and jelly roll.

c. Chiffon-Type Cakes. Chiffon-type cakes are a variation of foam-type cakes, but they contain some shortening (salad oil).

79. Use of Prepared Cake Mixes

The various types of prepared cake mixes listed in Federal Supply Catalog Group 89 are not authorized for use in Army central pastry kitchens; however, they may be used in unit messes. The Air Force authorizes the use of prepared cake mixes both in central pastry kitchens and in messes.

80. Functions of Cake Ingredients

a. Flour. Flour is the chief structure builder in most cakes. To give satisfactory performance in cake production, flour must be capable of forming a soft-yielding gluten which does not develop a significant degree of toughness during cake mixing; however, the gluten must possess sufficient strength and be present in an adequate amount to insure the formation of a fine cellular structure in the cake. The gluten formed during the mixing process coagulates during the baking process and helps to support the weight of the sugar and shortening. Most flour milled for cake baking is made from soft wheat and has a low protein content. Cake flour should be bleached because bleached flour is able to carry more sugar, shortening, and water than unbleached flour. Flour, being a drying agent, causes cakes to dry out; therefore, only as much flour as is needed to produce a satisfactory cake should be used. The Armed Forces procure type II soft wheat flour for cake making. This flour is properly bleached and conditioned and has a protein content that does not exceed 9.2 percent. When it is necessary to use type I hard wheat flour for cake making, a better product will result if cornstarch is substituted for a part (up to 10 percent) of the flour. Increasing the starch content of the flour decreases the protein content.

b. Sugar. Sugar is used in cakes as a sweetener. It is a tenderizer because it has a softening effect on flour proteins; it allows the cake crust to color at a lower temperature because it lowers the caramelization point of the batter; and it improves the keeping quality of the cake through its moisture-retaining qualities. Sugar crystals help to cut air into the batter during

the mixing process. Sugar should be completely dissolved in the batter. Four factors that govern the dissolving of the sugar are the mixing time, the mixing temperature, the size of the sugar crystals, and the amount of moisture in the mix.

c. Sirup. To improve the keeping qualities of the finished product and to provide the necessary elasticity—for example, in jelly roll—sirup may be substituted for a part of the sugar normally used in a mix. When sirup is used, the amount of liquid in the mix must be reduced to compensate for the moisture content of the sirup. Sirup cannot be substituted for sugar pound for pound. To determine how much sirup to use, divide the amount of sugar to be replaced (for example, 50 pounds) by the solid content of the sirup (expressed as a percentage). The sirups normally issued for baking have an approximate solid content of 80 percent.

Example: $50 \div .80 = 62.5$ pounds of sirup to be used. To determine the number of pounds of liquid to be subtracted from the formula, subtract the number of pounds of sugar to be replaced (50) from the number of pounds of sirup to be used (62.5).

Example: $62.5 - 50 = 12.5$ pounds of liquid to be subtracted from the formula.

d. Salt. Salt is used primarily to bring out the natural flavors of the other ingredients in the cake and to prevent excess sweetness.

e. Shortening. Shortening, being a form of fat, does not dissolve in the liquid of the cake batter. In order to create a stable and uniform cream when making a cake batter, it is necessary to overcome this natural characteristic of the shortening to permit the shortening to fulfill its function in the cake. In recipes containing regular shortening, this is done by using relatively low amounts of sugar and liquids. In cakes containing relatively high amounts of sugar and liquids (high sugar-to-flour ratio cakes), it is done by using an emulsified type of shortening. The ability of the emulsifying agent in the shortening to satabilize a fine suspension of oil in water permits the addition of relatively larger portions of sugar and liquid ingredients than of flour. This type of shortening, having greater emulsifying powers, will

mix more completely with the liquid ingredients of the cake batter and thereby will aid in increasing the volume of the cake. The functions of shortening in cakes are to—

- (1) *Improve the eating quality.* Because shortening does not dissolve in water and does not mix readily with water, it keeps the wet particles of cake batter apart and prevents the formation of a compact solid when the cake is baked. The more shortening used within the limits of formula balance and the more thoroughly it is mixed with the other ingredients, the greater the number of particles in the cake batter and the greater the separation of the particles. This produces a tender cake.
- (2) *Aid in producing volume.* The interior structure of the cake is lubricated by the action of the shortening in keeping the particles of batter apart. At the same time, with an emulsifying type of shortening, small particles of fat are entrapped and are distributed with the moisture. When the gases from the baking powder, the air that is worked into the batter during mixing, and the moisture expand in the oven, the shortening acts as an internal lubricant to reduce internal friction and to allow the expanding bubbles to slide past one another, creating greater expansion and, therefore, more volume.
- (3) *Enhance the freshness of the cake.* The use of the emulsified type of shortening and the correct mixing procedures will create a uniform and stable emulsion that coats the greatest number of batter particles with a thin layer of shortening. When the cake is baked, this film of fat retards the escape of moisture and thus enables the cake to retain its freshness for a longer period of time.

f. Eggs. Eggs provide structure, moisture, flavor, color, and food value in cakes. Structure, the most important contribution, is provided by the coagulation of the egg proteins during the baking process. The air incorpora-

ted in the eggs during mixing assists in leavening. In foam-type cakes, eggs are the primary leavening agent.

g. Milk Solids. Milk solids add nutritive value and flavor, retain moisture, and aid in controlling crust color. The milk sugar caramelizes at a low temperature and gives the desired crust color. Because of their binding effect on flour protein, milk solids cause toughness in the finished product.

h. Leavening. Leavening contributes tenderness to cakes. The type of leavening used in a cake formula depends on the type of cake being prepared, the richness of the formula, the consistency of the batter, and the baking temperature. Rich formulas use less chemical leavening, need lower oven temperature, and have more air incorporated during mixing. Lean formulas use more chemical leavening, need higher oven temperature, and have less air incorporated during mixing. Formulas baked in large containers require proportionately less water and baking powder than those baked in small containers. Baking soda is used to neutralize the acidity of acid ingredients such as molasses, buttermilk, or sour milk; it is used in devil's food cake to produce the characteristic red color. Too much soda in a cake formula will cause the finished product to have a soapy taste. High altitude baking requires formula adjustment in leavening (app. II).

i. Liquids. There is liquid in one form or another in all cake formulas. The liquid may be in the form of water, liquid milk, or eggs; it is also present in any ingredient that contains moisture. Moisture performs several functions in cake production, such as dissolving sugar, developing gluten, making the action of baking powder possible, and regulating batter consistency and temperature; it also contributes to structure and tenderness. The water portion of the formula should be adjusted to compensate for the moisture found in other ingredients. An emulsified shortening will carry more water; therefore, it allows the use of more sugar.

j. Flavoring Extracts and Spices. Flavoring extracts and spices are used in cakes to provide a particular flavor. Great care and judgment should be exercised in selecting the flavoring that is best suited to the type of cake being

made. Since the amount of flavoring used will affect the flavor of the finished product, it is essential that the flavoring be weighed accurately.

81. Formula Balance

If quality cakes are to be produced, ingredients must be used in proper proportions. Table 5 shows the approximate range of percentages of ingredients in various types of cakes. Following are the basic rules for formula balance in cakes.

a. Batter-Type Cakes.

- (1) *Rule I (sugar-flour).* The weight of the sugar should be equal to or exceed the weight of the flour. For white or yellow cakes, the top sugar-flour ratio would appear to be 145:100 (table 5, layer cake). Once the sugar-flour ratio has been selected, the amounts of sugar and flour become fixed; and the amounts of the other ingredients must be adjusted to maintain proper formula balance.
- (2) *Rule II (eggs-shortening).* The weight of the eggs should be equal to or exceed the weight of the shortening.
- (3) *Rule III (liquid-sugar).* The combined weight of the liquid, including the eggs, should be equal to or exceed the weight of the sugar.
 - (a) *Yellow layer cake.* The weight of the liquid usually exceeds the weight of the sugar by 20 to 30 percent.
 - (b) *Devil's food cake.* The weight of the liquid usually exceeds the weight of the sugar by 40 to 50 percent. The extra moisture is needed to offset the drying effect of the cocoa.
 - (c) *Pound cake.* The weight of the liquid and the weight of the sugar should be about equal.

b. Foam-Type Cakes.

- (1) *Sponge cake.* The basic formula for sponge cake is as follows: Flour, 100 percent; sugar, 166 percent; eggs, 166 percent; and salt, 3 percent. To alter

the mix, add flour to the basic formula and add other ingredients as follows: For each 1 part of flour added, add .75 to 1 part sugar; .75 to 1 part liquid milk; .015 to .030 part baking powder; and .03 part salt. Following are the basic rules for formula balance in sponge cake.

- (a) *Rule I.* The weight of the sugar should be equal to or exceed the weight of the whole eggs.
- (b) *Rule II.* The combined weight of the liquids and the whole eggs should be about one and a fourth times greater than the weight of the sugar.
- (c) *Rule III.* The weight of either the

sugar or the whole eggs should exceed the weight of the flour.

- (d) *Rule IV.* The combined weights of the whole eggs and the flour should exceed the combined weights of the sugar and the liquid milk or water.
- (2) *Angel food cake.* Angel food cake formulas are easy to balance because they have so few ingredients.
 - (a) *Rule I.* The weight of the sugar should equal the weight of the egg whites.
 - (b) *Rule II.* The weight of the flour, or of the flour and the other drying ingredients, should equal about one-third the weight of either the sugar or the egg whites.

Table 5. Approximate Range of Percentages of Ingredients in Cakes

Type of cake	Ingredients	Baker's percent
Layer Cake -----	Flour	100
	Sugar	100 to 145
	Shortening	30 to 60
	Eggs	30 to 70
	Baking powder	3 to 6
	Milk solids	7 to 15
	Salt	2 to 4
	Total liquid (including eggs)	100 to 195
Pound Cake * -----	Flour	100
	Sugar	100 to 125
	Shortening	40 to 100
	Salt	2 to 3
	Eggs	40 to 100
	Baking powder	0 to 2
	Total liquid (including eggs)	100 to 125
Angel Food Cake -----	Flour	100
	Sugar	261 to 309
	Egg whites	261 to 309
	Cream of tartar	3.85 to 4.50
	Salt	3.85 to 4.50
	Flavoring	3.85 to 4.50
Sponge Cake -----	Flour	100
	Eggs	50 to 166
	Sugar	100 to 166
	Salt	3 to 4
	Baking Powder	0 to 2
	Total liquid (including eggs)	62 to 208

* In white pound cake, weight of egg whites is 10 to 20 percent greater than weight of shortening; baking powder is increased 2 to 4 percent.

82. Mixing Methods

Most cake formulas prescribe the mixing method best suited for the particular mix. The methods of mixing the various types of cakes are described below. Regardless of the type of cake being made or the mixing method used, the ingredients must be carefully weighed before mixing is begun.

a. Batter-Type Cakes. There are several ways of mixing batter-type cakes, but the preferred method is the two-stage method ((1) below) because it is simple and there is less likelihood of error. The size of the mixing bowl to be used is determined by the amount of batter being mixed; there should be just enough batter in the bowl to cover the mixing paddle. Shortening should be plastic, not too hard and not too soft. The temperature of the finished batter should be between 72° and 78° F.

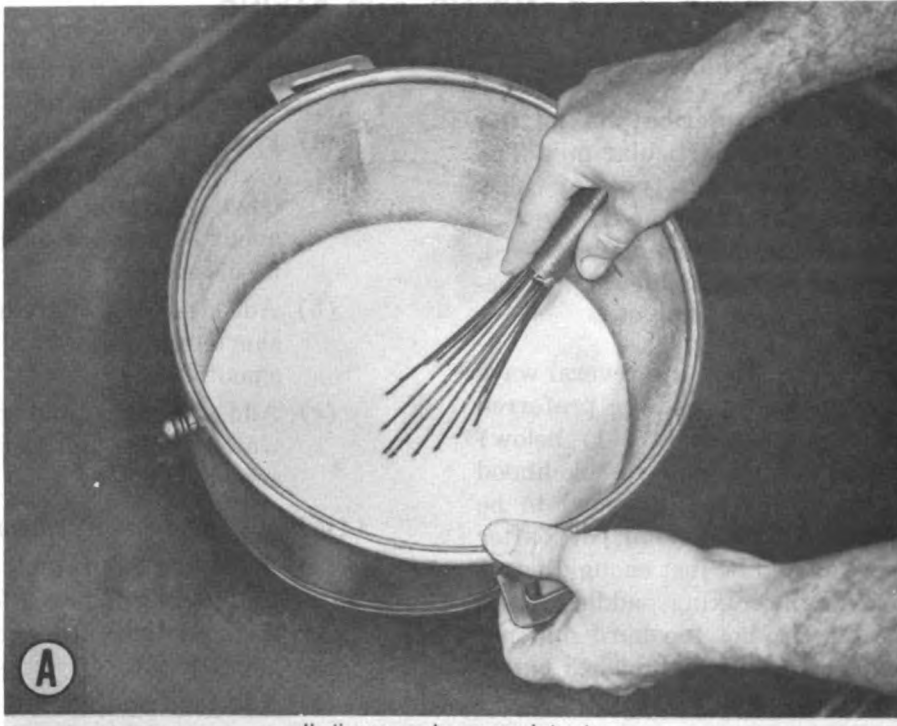
(1) *Two-stage method.*

- (a) Sift all dry ingredients together twice. Place dry ingredients, shortening, milk, and main portion of the water into the mixing bowl. To avoid splashing, mix at slow speed until all ingredients are combined; then mix for 3 minutes at medium speed. Scrape bowl thoroughly.
- (b) Combine eggs, remaining water, and flavoring. Add slowly to ingredients in mixing bowl while mixing at slow speed. Scrape bowl thoroughly. Mix for 3 minutes at medium speed.
- (2) *Streamlined method.* Place all ingredients except eggs in one bowl. Using the wire whip attachment, beat the batter at high speed for about 1 minute. Mixing time will vary with the amount of batter in relationship to the size of the bowl. Add the eggs and stir at slow speed for about 30 seconds. This method requires a slight reduction in the amount of baking powder used because of the greater aeration of the batter during mixing.
- (3) *Sugar-water method.* When using this

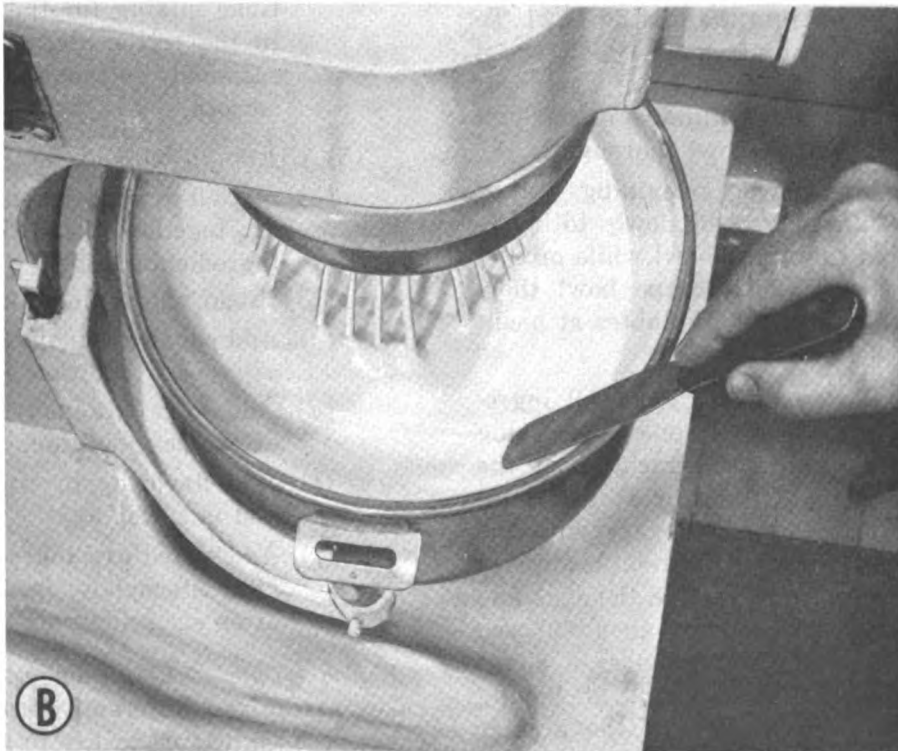
method, reduce the amount of baking powder approximately 20 percent.

- (a) Place all of the sugar and slightly over half of the water in the mixing bowl. Agitate this mixture for about 30 seconds or until the sugar is dissolved.
- (b) Add the dry ingredients and the shortening; mix until the batter is smooth.
- (c) Add the eggs and the remaining water; mix until the batter is smooth.
- (4) *Flour-shortening (blending) method.*
 - (a) Place the flour and shortening in the mixing bowl. Blend until the flour particles are thoroughly coated with fat.
 - (b) Add the remainder of the dry ingredients and blend well.
 - (c) Add about 75 percent of the liquid and mix well. Add the remaining liquid, including the eggs, and continue mixing for the time specified in the recipe. Scrape the bowl occasionally so that the batter will be smooth.
- (5) *Creaming method.*
 - (a) Sift all dry ingredients, except sugar, together three times; put dry ingredients aside.
 - (b) Cream shortening until it is smooth.
 - (c) Add sugar gradually, creaming well after each addition.
 - (d) Add eggs gradually, beating well after each addition.
 - (e) Add flavoring to creamed mixture and mix well.
 - (f) Add sifted dry ingredients and liquids alternately; beat until smooth after each addition.

b. Foam-Type Cakes. Sponge and angel food cakes are mixed differently from batter-type cakes because it is necessary to incorporate air in the mix to obtain the desired volume. The eggs are beaten with a portion of the sugar



Heating eggs and sugar over hot water.



Checking egg and sugar mixture for proper consistency.

Figure 23. Preparing sponge cake batter.

and salt to form a foamy mass. When liquid is included in the formula, it is added gradually to the beaten egg-sugar-salt mixture. The flour, starch (when used), and baking powder are sifted and blended thoroughly and are then gently folded into the whipped mixture.

(1) *Sponge cakes.*

(a) *Sponge mix.* When whole eggs or yolks are used in a sponge mix, the volume of the mix will be increased if the egg and sugar mixture is heated to a temperature of 100° to 110° F. The sugar dissolves more readily and becomes more evenly distributed in the egg liquid when the mixture is heated slightly. The mixture can be heated by stirring the egg and sugar mixture over a container of hot water (A, fig. 23). The eggs must be stirred constantly. Do not overheat the mixture; overheating may cook the eggs, causing the volume to decrease. When the eggs and sugar are properly heated, beat until the mixture is light and sufficiently firm to hold a crease (B). When more sugar than eggs is desired in the mix, dissolve the extra sugar in the liquid portion of the mix. In the preparation of sponge cake for jelly roll, a better rolling quality can be obtained if sirup is substituted for a portion of the sugar (par. 80c). When sirup is used, mix it with the liquid portion of the mix. When butter or shortening is required in the mix, heat the liquid and fat together and add alternately with the flour. Baking powder may be used in some formulas to insure correct volume. Baking powder with a regulated control action should be used, because the quick-acting type will cause the finished product to have a low volume.

(b) *Butter sponge mix.* In straight butter sponges, when no liquid is used, heat the mixture to 100° F. before beating it. The mixture should be heated so that the melted butter

will not be chilled when it is added to the mixture. Add the melted butter in a slow stream and gently fold it into the mix at the end of the mixing process.

(2) *Angel food cake.* Angel food cake is prepared from egg whites, granulated sugar, salt, flavoring, cream of tartar, and flour. The egg whites should be fairly cool (about 70° F.) for whipping. Be sure that the container in which the egg whites are to be whipped is free of grease and oil. Beat the egg whites with the cream of tartar, salt, and flavoring until foamy. Add approximately half of the sugar in a slow stream. Beat to a wet peak. To prevent overbeating the egg whites (the cake will collapse in the oven if the egg whites are overbeaten), check frequently for wet peak. To test for wet peak, dip forefinger into the beaten egg whites and get a small amount of the mixture out of the bowl; the egg whites should form a peak and feel wet to the touch. After the egg whites have been properly beaten, gently fold in the flour and sugar, which have been sifted together five times. Mix only until the flour and sugar are distributed.

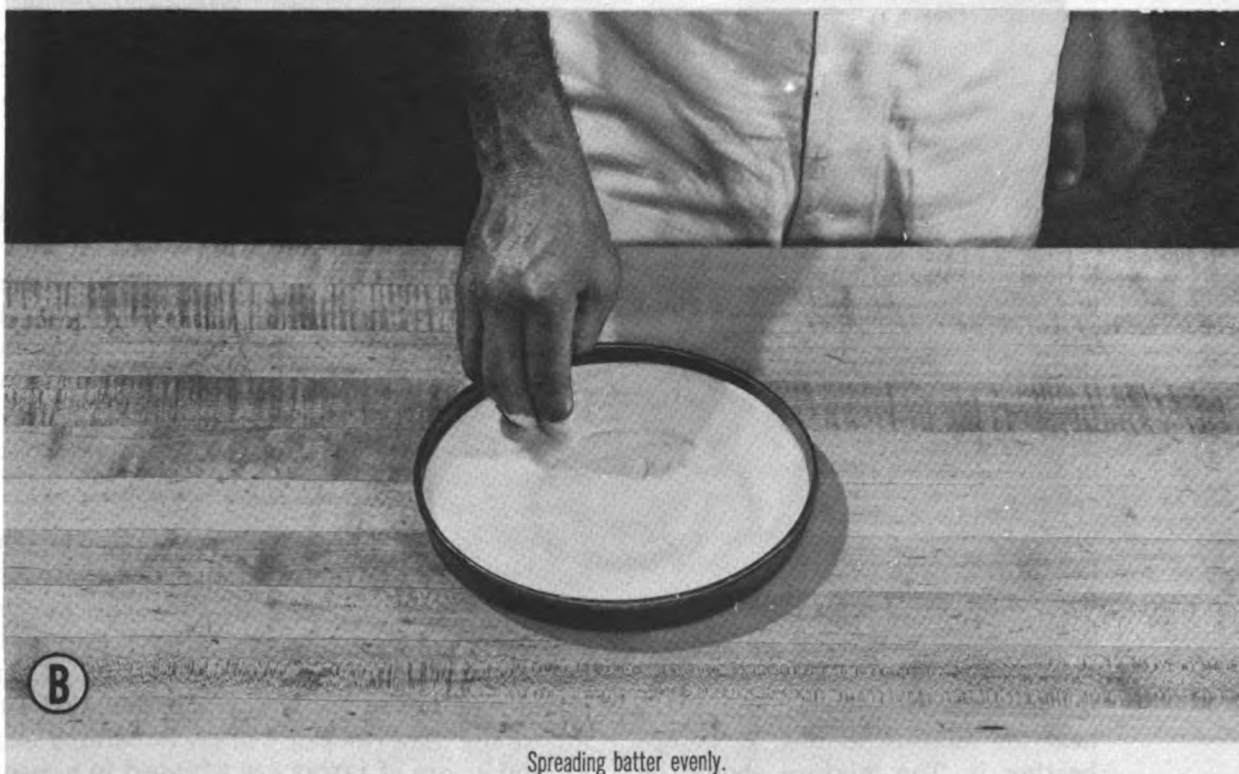
c. Chiffon-Type Cakes. Chiffon-type cakes are a variation of foam-type cakes. Formulas contain a high percentage of liquid, with egg yolks and egg whites forming the greatest part of the liquid. The aeration comes from the air that is beaten into the egg whites and from the baking powder used. Salad oil makes up the shortening content of the mix.

Note. Unless a good grade of salad oil is used, a good emulsion will not form; the oil will settle out, causing a watery-looking batter.

Except for the higher egg content and the salad oil used, the formulas are very similar to high-sugar layer cake formulas. The mixing procedure is in two stages. All of the ingredients except the egg whites, cream of tartar, and about half of the sugar are combined and mixed slightly. The egg whites, remaining sugar, and cream of tartar are whipped to a medium peak. The first mixture is gently folded in-



Scaling batter.



Spreading batter evenly.

Figure 24. Panning batter for 9-inch layer cake.

to the beaten egg whites. Do not whip the egg whites until they are too dry. If the egg whites are overwhipped, they will not mix properly with the other ingredients; and the batter will appear to be curdled.

83. Preparation of Cake Pans

Angel food cakes are baked in ungreased pans. The pans used for other types of cakes must be prepared before the batter is placed in the pans. The way in which a cake is to be finished and served determines how the pans must be prepared. If a cake is to be served direct from the pan, the pan should be greased and dusted with flour, or greased with a specially prepared pan grease. If the cake is to be removed from the pan, the pan should be greased and lined with a pan liner or greased paper to facilitate removal of the baked cake. Pan grease is made by creaming together two parts shortening and one part flour. In cold weather a little salad oil should be added to the flour-shortening mixture to facilitate spreading.

84. Planning

- a. Use the size of pan specified in the recipe.
- b. Place the amount of batter specified in the recipe in the pan (A, fig. 24). Too much batter may cause the cake to sag in the center; too little batter may cause the cake to be pale, to lack volume, and to shrink excessively.
- c. Spread batter evenly (B) so that the cake will bake evenly.

85. Baking

- a. Be sure that oven is working properly—that neither top nor bottom heat is excessive and that there are no hot or cold spots in the oven.
- b. Do not place pans too close to each other or to the sides of the oven. Space pans evenly so that the heat can circulate around each pan.
- c. Do not jar cakes while they are baking. Jarring may cause the cakes to fall.
- d. Bake cakes at the temperature specified in the recipe. Cakes that are baked at improper oven temperatures will develop certain faults.

(1) *Batter-type cakes.*

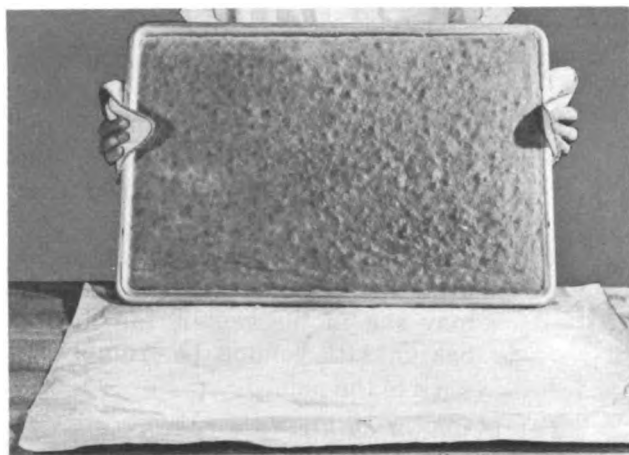
- (a) If a batter-type cake is baked in an oven that is too hot, the top may peak, tunnels may form, and the cake may lack volume, or the crust may crack or become too thick or too dark.
- (b) If a batter-type cake is baked in an oven that is not hot enough, the cake may sag in the center, fall during baking, lack volume, be crumbly, or stick to the pan.

(2) *Foam- or chiffon-type cakes.*

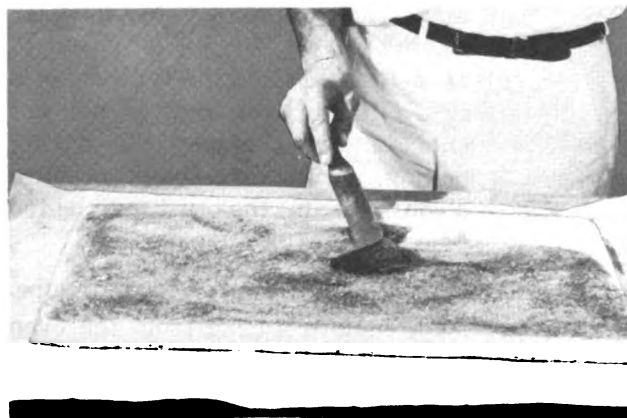
- (a) If a foam- or chiffon-type cake is baked in an oven that is too hot, the cake may lack volume, shrink excessively, or be tough; the crust may crack or become too dark or too thick.
- (b) If a foam- or chiffon-type cake is baked in an oven that is not hot enough, the cake may fall during baking, shrink excessively, or have a coarse grain; the crust may be too pale.

e. Follow baking time specified in the recipe.

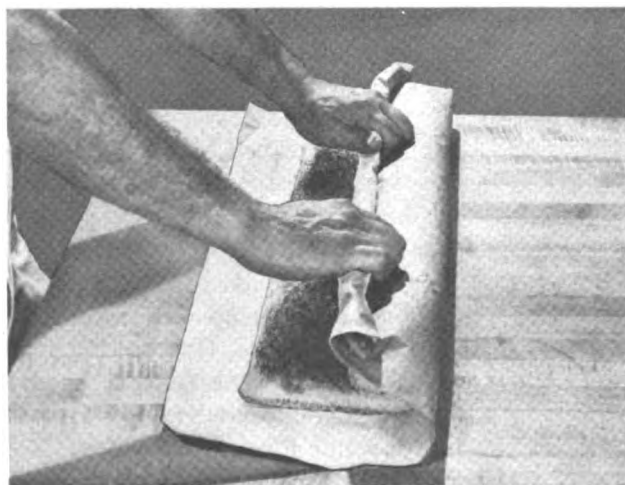
- (1) Do not remove a cake from the oven until it is done. To test for doneness, touch the top of the cake near the center; if an indentation remains, the cake is not done and should be baked another 3 to 5 minutes and then be tested again. A cake that is underbaked will develop certain faults.
 - (a) *Batter-type cakes.* Underbaking may cause a batter-type cake to sag in the center or to have a pale or sticky crust.
 - (b) *Foam- or chiffon-type cakes.* Underbaking may cause a foam- or chiffon-type cake to sag in the center, to shrink excessively, or to have a crust that is sticky or too thick.
- (2) Do not overbake cakes. A cake that is overbaked will develop certain faults.
 - (a) *Batter-type cakes.* Overbaking may cause a batter-type cake to be dry or to shrink excessively; the crust may become hard or too thick.
 - (b) *Foam- or chiffon-type cakes.* Overbaking may cause a foam- or chiffon-



1. As soon as sponge cake comes from the oven, remove from pan onto paper sprinkled with granulated sugar.



2. Spread jelly over top of cake.



3. Roll cake to form jelly roll.

Figure 25. Preparing jelly roll.

fon-type cake to be too dry, to shrink excessively, or to have a crust that is too dark, too thick, or too hard.

86. Removing Cakes From Pans

a. Batter-Type Cakes. When a batter-type cake comes from the oven, it should be placed on a rack and cooled for 10 minutes before it is removed from the pan. Nine-inch layers should be removed from the pan after 10 minutes, placed on paper sprinkled with granulated sugar, and allowed to finish cooling. Sheet cakes that are not to be frosted in the pan should be removed from the pan after 10 minutes and placed on an inverted pan or on paper springled with granulated sugar. If a cake is left in the pan too long, it may stick to the pan.

b. Angel Food and Chiffon Cakes. Angel food and chiffon cakes that are not cooled properly are likely to sag in the center or to shrink excessively. Cool the cake in the pan. Invert the pan and prop it up with a cup or can at each corner so that the top of the cake does not touch any surface. After the cake is cool, loosen it by running a knife around the inside of the pan. Remove cake from pan onto an inverted pan or paper sprinkled with granuated sugar.

c. Sponge Cake for Jelly Roll. Sponge cake that is to be made into a jelly roll is removed from the pan as soon as it comes from the oven because the cake must be rolled while it is warm. The cake is placed on paper sprinkled with granulated sugar (fig. 25).

87. Faults in Cakes

Table 6 lists faults that might occur in layer cake, angel food cake, sponge cake, pound cake, and fruit cake, together with possible causes of the faults. The "Remarks" column gives some suggestions for correction of the faults; however, where the correction is obvious, this column has been left blank. For example, if the cause is "oven too hot," the obvious correction is to bake the cake at the temperature specified in the recipe; or if the fault is "not enough batter for size of pan," the obvious correction is to scale the batter according to the recipe.

Table 6. *Faults in Cakes; Causes and Corrections*

Faults	Causes	Remarks
LAYER CAKE:		
Falls during baking -----	Too much leavening, sugar, or shortening; too few eggs; too little water; wrong type of shortening; wrong type of flour. Batter overcreamed. Baking temperature too low; cake jarred while baking.	Do not use strong flour. Use hydro-generated shortening. Do not add eggs to batter when they are too cold.
Lacks volume -----	Insufficient leavening or leavening of poor quality. Ingredients faulty. Batter too stiff, too soft, or too warm; too little batter for size of pan. Oven temperature too high.	
Crust too thick -----	Too much sugar; flour too strong. Cake overbaked; oven temperature too high or too low. Baking pan too deep.	
Is too tender -----	Too much shortening, sugar, or leavening; flour too weak; too few eggs. Batter not mixed well enough.	
Is tough -----	Too little sugar or shortening; flour too strong; too many eggs. Eggs overbeaten. Batter overbeaten or underbeaten.	Avoid overmixing or undermixing. Mix at speed indicated in recipe. Ingredients should be at room temperature when mixed.
Cracks on top -----	Too little leavening, shortening, or sugar. Batter too stiff. Batter overbeaten. Oven temperature too high.	
Crust too dark -----	Too much sugar. Cake overbaked; oven too hot.	
Has coarse grain -----	Too much sugar on leavening; wrong type of leavening, flour, or shortening. Ingredients improperly mixed. Oven temperature too low.	
Has uneven holes or tunnels -----	Too much or too little sugar; wrong type of shortening; flour too strong; too many eggs. Ingredients improperly mixed.	Add more sugar or shortening.
Shrinks excessively -----	Too much leavening; wrong type of flour or shortening. Formula too lean. Batter overmixed. Pan greased too heavily; too little batter in pan. Cake baked improperly.	
		Do not overbake. Do not use an oven that is too hot or too cool.

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Spots on top crust -----	Sugar too coarse. Ingredients mixed improperly. Too much steam in oven.	Make sure that all sugar is dissolved.
Molds readily -----	Utensils or storage area not sanitary; personnel not clean. Too many moisture-retaining ingredi- ents used. Cake underbaked.	
Has off color (white cake) --		Add small amount of cream of tartar to overcome inferior crumb color. Do not allow cake to bake too slowly.
Has poor flavor -----	Oven too cool. Ingredients of inferior quality. Ingredients used in incorrect propor- tions. Pan dirty or pan grease rancid.	Use flour, eggs, shortening, and flavoring as called for in formula. Measure flavoring, leavening, and salt carefully.
Crust peels off -----	Too much shortening or sugar; flour too weak. Cake cooled improperly.	
Hollow spots on bottom ----	Egg content too high. Batter too stiff. Pans damp or greased too heavily. Bottom heat excessive.	Allow cakes to cool slowly in a place that is free from drafts. Decrease egg content or increase milk and leavening to balance formula. Use enough moisture to allow mix to flow properly. If air pockets form under paper liner, use perforated liner. When making sheet cake, use double pan. When making layer cake, put layer pans in sheet pan. Increase sugar and shortening.
Center peaks -----	Formula too lean. Too many eggs. Batter overmixed. Oven too hot.	Use fewer eggs and more milk and leavening.
Crust pale -----	Sugar too coarse or not enough sugar used; wrong type of shortening; too little leavening. Batter mixed improperly. Not enough batter in pan. Cake underbaked.	
Unevenly baked -----	Batter improperly mixed Pan dented or uneven. Too much batter in pan; batter not spread evenly. Oven faulty.	
ANGEL FOOD CAKE:		
Falls during baking -----	Too little flour or too much sugar. Egg whites overbeaten. Cake jarred while baking. Oven temperature too low.	
Lacks volume -----	Not enough cream of tartar. Egg whites underbeaten. Batter overmixed.	Avoid overmixing batter after flour has been added.

Table 6. *Faults in Cakes; Causes and Corrections*--Continued

Faults	Causes	Remarks
	Grease in mixing or baking pan. Not enough batter in pan. Oven too hot.	
Crust too thick -----	Cake overbaked. Baking temperature too high or too low.	
Is tough -----	Too much flour or too little sugar. Batter overmixed. Egg whites overbeaten or underbeaten.	
Egg whites do not beat properly.	Grease in mixing bowl or on beater. Egg whites of poor quality. Mixing bowl too large. Flavoring added before whites are beaten.	The fat in broken egg yolks, when mixed with egg whites, will keep whites from beating properly. If frozen egg whites are used, thaw and mix thoroughly before beating.
Cracks on top -----	Too much flour. Egg whites overbeaten. Oven temperature too high.	
Crust too dark -----	Cake overbaked. Oven temperature too high.	
Has coarse grain -----	Sugar too coarse. Acid content too high. Egg whites overbeaten. Batter mixed at high speed. Oven temperature too low.	
Has uneven tunnels or holes.	Ingredients mixed improperly. Tough chalazas in egg whites.	These are the bands that connect the yolk to the lining membrane at the ends of the eggs.
Has tight grain -----	Moisture content of egg whites too high. Egg whites underbeaten. Batter overmixed. Greased pan used.	Use ungreased pan.
Shrinks excessively -----	Egg whites overbeaten or underbeaten. Cake overbaked or baked at wrong temperature. Cake cooled improperly.	See paragraph 86.
Has spots on crust -----	Sugar too coarse. Ingredients improperly mixed.	
Has off color -----	Not enough acidity in batter. Tin rubbed from bowl during mixing process.	Add cream of tartar to batter. Check equipment for wear and take action to keep equipment in proper condition.
Poor flavor -----	Lack of or overuse of salt or flavoring. Too much acid in batter. Pan dirty. Cake stored improperly.	See paragraph 25.

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Hollow spots on bottom or sides.	Egg whites overbeaten. Too much moisture in batter. Moisture or grease on pan. Batter placed in pan carelessly.	Make sure that there are no air pockets under the batter.
Crust pale -----	Too much flour or not enough sugar. Ingredients improperly mixed. Oven too cool.	
Unevenly baked -----	Batter improperly mixed. Uneven oven heat.	
Spoils readily -----	Cake underbaked. Careless handling of finished product.	
	Dirty utensils or dirty baking pan used. Cake stored improperly.	Do not handle with wet or dirty hands.
SPONGE CAKE:		
Falls during baking -----	Too much leavening, too much sugar, not enough flour, or wrong type of flour. Oven too cool.	
Lacks volume -----	Formula not balanced. Batter improperly mixed. Batter too stiff. Time between mixing and baking too long. Not enough batter for size of pan. Improper oven temperature, or excessive steam in oven.	
Crust too thick -----	Too much sugar. Too much batter in pan. Oven too hot, or cake overbaked.	
Is tough -----	Not enough sugar, shortening, or leavening; too much flour. Eggs underbeaten. Batter overmixed. Oven temperature too low.	
Cracks on top -----	Egg content too high; too little sugar, leavening, or moisture. Oven too hot.	
Crust too dark -----	Too much sugar. Cake overbaked or oven temperature too high.	
Has coarse grain -----	Too much leavening or sugar. Eggs beaten too long or at too high a speed. Oven too cool.	
Has uneven holes or tunnels.	Batter improperly mixed.	
	Too much bottom heat in oven.	
Grain too close -----	Formula lean. Fat content too high, not enough leavening, sugar too coarse, too much cocoa or chocolate.	

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Shrinks excessively -----	Batter overmixed. Eggs underbeaten. Too much leavening. Batter overmixed or eggs overbeaten. Baking pan greased too heavily. Not enough batter for size of pan. Cake cooled improperly.	Do not use sugar that is too coarse. Do not use eggs with crusted yolks or eggs that have been allowed to coagulate.
Has spots on top crust -----	Ingredients faulty.	
Molds readily -----	Baking pan greased too heavily. Flash heat or steam in oven. Utensils dirty. Cake improperly stored or handled carelessly.	
Has off color -----	Too many moisture-absorbing ingredi- ents. Too much egg color. Shortening not well distributed in mix. Lack of alkalinity in dark sponges. Cake overbaked or underbaked.	The use of milk solids in the batter may help to improve the color.
Has poor flavor -----	Ingredients old or improperly stored. Too much artificial flavoring. Pan grease rancid or baking pan dirty. Cake overbaked. Cake stored improperly.	
Has poor keeping quality --	Sugar and fat content low; too little moisture. Cake overbaked or improperly cooled.	
Crust peels off -----	Too much sugar. Eggs overbeaten. Cake improperly baked (flash heat, excessive top or bottom heat, or steam in oven). Cake improperly cooled.	
Has hollow spots -----	Ingredients not evenly distributed throughout mix. Pans damp or dented; too much pan grease. Too much bottom heat in oven.	
Center peaks -----	Too little sugar or too many eggs. Batter too stiff. Batter overmixed or eggs under- beaten. Too little batter in pan or pan too shallow. Flash heat in oven, or oven too hot.	
Has pale crust -----	Low sugar content; not enough leav- ening or too much shortening. Batter overmixed or eggs under- beaten.	
Bakes unevenly -----	Ingredients not evenly distributed throughout the mix.	

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Has poor texture -----	Batter not spread evenly in pan. Pan dented. Flash heat, hot or cold spots in oven, or too much bottom heat. High acid content; too much leaven- ing, sugar, or soda. Batter improperly beaten.	Ingredients must be evenly distrib- uted; there must be no flour pellets left in the mixed batter. Batter must be mixed at speed indicated in recipe.
Eggs do not beat properly -----	Batter too stiff. Time between mixing and baking too long. Cake jarred during baking. Cake overbaked or underbaked. Eggs not properly prepared. Flavoring added before eggs are beaten. Eggs not whipped at proper speed. Grease on mixing bowl, or bowl too large for the number of eggs being whipped.	If egg yolks are gummy, add a small amount of water. When using frozen eggs, thaw completely and stir thoroughly. If eggs are heated (par. 82), they must be stirred con- stantly and must be overheated.
POUND CAKE:		
Lacks volume -----	Too little leavening or too many mois- ture-retaining ingredients. Wrong type of shortening. Batter too soft, too stiff, or too warm. Eggs too cold. Sugar and shortening improperly creamed. Not enough batter for size of pan. Oven too hot.	If cocoa or chocolate is added, formula may have to be adjusted. Use hydrogenated shortening. Have eggs at room temperature for beating. Cream thoroughly; use bowl of proper size and use speed indicated in recipe. Too much heat causes the cake struc- ture to form before the leavening has a chance to produce the desired volume.
Has sugary top -----	Too much sugar or not enough mois- ture for amount of sugar used. Also, lack of salt or too little salt in formula will increase the possi- bility of sugar formation on crust. Sugar too coarse. Time between mixing and baking too long. Steam in oven.	Use sugar that will dissolve com- pletely. A crust will form on top of batter if allowed to stand exposed to air.
Falls during baking -----	Too much sugar, shortening, or leav- ening; too few eggs. Batter overcreamed.	

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Crust too thick -----	Cake jarred during baking. Oven temperature too low. Too much sugar. Too much batter in pan. Baking pan not lined. Overbaked, or oven temperature incorrect.	
Is tough -----	Not enough sugar or shortening; too many eggs. Batter overmixed, or ingredients not blended properly.	When cocoa or chocolate is used, formula may have to be adjusted.
Crust too dark -----	Too much sugar. Cake overbaked, or oven too hot.	
Has uneven holes or tunnels-----	Too much or too little sugar; too many eggs. Tough chalazas in eggs. Batter blended or mixed improperly.	Use frozen eggs. Follow recipe carefully for procedure for blending leavening and flour. Have ingredients at proper temperature for creaming. Avoid overmixing, undermixing, or mixing at high speed. Remove any lumps of sugar or shortening that stick to bowl bottom or creaming arms and blend into batter. Do not allow batter to become stiff.
Is too tender -----	Too few eggs; too much sugar, shortening, or leavening. Batter undermixed.	
Cracks on top -----	Not enough leavening, sugar, or shortening; egg content too high; failure to adjust formula when cocoa or chocolate is added. Fruit not soaked properly.	If raisins or other fruits are added, soak as specified in recipe; dry fruits will absorb moisture from the batter and cause cracks to form.
Has open grain -----	Batter overmixed. Batter too stiff. Batter scaled improperly. Oven too hot, or too much top or bottom heat. Too little liquid in batter, too much invert sirup, too many eggs, too little leavening; formula not adjusted when cocoa or chocolate is used. Leavening old. Batter too stiff. Hard wheat flour used. Batter undermixed.	
Shrinks excessively -----	Formula lean; or too much leavening or moisture. Batter overcreamed or overmixed; eggs overbeaten. Pan greased too heavily; not enough batter in pan.	Use soft wheat flour.

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Has spots on top crust -----	Cake overbaked or underbaked; oven temperature too low. Cake cooled improperly. Sugar too coarse or not completely dissolved. Flash heat, or too much steam in oven.	
Molds readily -----	Cake handled carelessly or stored improperly. Dirty utensils used.	
Has off color (white or yellow cake).	Too much leavening, or acidity of batter too low. Fruit not mixed well with other ingredients. Oven too cool. Batter too warm.	To increase acidity, add cream of tartar to mix.
Has poor flavor -----	Too much flavoring or leavening; not enough salt. Pan dirty or pan grease rancid. Cake overbaked. Cake cooled or stored improperly.	
Has poor keeping qualities--	Not enough moisture or moisture-retaining ingredients; too little sugar and shortening; too much leavening. Cake overbaked. Cake cooled or stored improperly.	Increasing moisture or moisture-retaining ingredients may help prevent cake from drying out rapidly.
Has hollow spot on bottom--	Egg content too high. Batter too stiff. Baking pan not properly prepared.	Add moisture. Dry pan thoroughly before using; place liner in pan carefully so that there will be no air pockets under the batter. Use perforated liner if possible. Do not use too much pan grease.
Center peaks -----	Too much bottom heat. Formula too lean; or egg content too high.	If this condition cannot be corrected, use double pan. If egg content is too high, use fewer eggs or increase amount of milk and leavening.
Has poor texture -----	Batter overmixed. Batter scaled incorrectly. Oven too hot. Too much leavening, sugar, shortening, acid or soda. Eggs not handled properly.	Avoid overbeating or underbeating. When using frozen eggs thaw completely and stir before adding to mix.
	Wrong type of shortening.	For best results, use hydrogenated shortening at a temperature of 70° to 75° F.
	Batter creamed improperly.	Use bowl of proper size for amount of ingredients being creamed. Adjust machine so that creaming arm reaches bottom of bowl; scrape creaming arm down so that no lumps of shortening remain.

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Crust peels off -----	Mixing speed too high. Cake overbaked, underbaked, or jarred while baking.	
Crust pale -----	Too much shortening or sugar. Too much top heat or too much steam in oven. Cake cooled improperly.	
Bakes unevenly -----	Low sugar or leavening content; too much flour. Wrong type of shortening or sugar used. Batter mixed improperly. Oven too cool.	Use hydrogenated shortening and fine sugar.
Eggs do not beat properly --	Leavening not distributed evenly. Batter not spread evenly in pan. Pan dented. Oven heat uneven or racks uneven.	Mix batter thoroughly.
	Eggs not properly prepared.	Eliminate excessive top or bottom heat and hot and cool spots in oven. Make sure that racks are even in oven.
	Flavoring added before eggs are beaten. Not beaten at proper speed. Grease on mixing bowl, or bowl too large for the number of eggs being whipped.	If egg yolks are gummy, add a small amount of water. When using frozen eggs, thaw completely and stir thoroughly.
FRUIT CAKE:		
Falls during baking -----	Too much shortening, leavening, or sugar, or not enough eggs. Batter overcreamed. Cake jarred during baking.	
Lacks volume -----	Not enough leavening. Ingredients of wrong type.	Better results are obtained if eggs are not too cold. Use hydrogenated shortening.
	Fruit content high.	A cake containing a high percentage of fruit mixture and a low percentage of batter will be smaller than a cake of equal weight containing less fruit and more batter.
Crust too thick -----	Batter too stiff. Not enough batter for size of pan. Oven too hot.	Add water.
Is too tender and crumbly --	Too much sugar in batter. Too much batter in pan. Oven too hot or cake baked at too low a temperature for too long a time.	
	Too much shortening, sugar, or leavening; too few eggs; lack of moisture-retaining ingredients.	

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Is tough -----	Batter undermixed or overcreamed. Batter too warm. Fruit not soaked.	Prepare fruit as specified in recipe.
Cracks on top -----	Not enough sugar or shortening, or too many eggs. Not enough leavening, sugar, or shortening. Wrong type of shortening. Fruit not soaked properly.	Use hydrogenated shortening. Prepare fruit as directed in recipe. If fruit is not soaked, it will take moisture from the batter and cause cake to crack on top.
Crust too dark -----	Batter overmixed or too stiff. Cake baked improperly.	Add water if mix is too stiff. Use some steam in oven; do not have oven too hot.
Has coarse grain -----	Too much sugar. Oven too hot.	
Shrinks excessively -----	Too much sugar or leavening. Ingredients mixed improperly.	Avoid creaming at a high speed and make sure that ingredients are not too warm and are thoroughly mixed.
Molds readily -----	Batter too stiff. Oven not hot enough. Too much leavening. Batter overcreamed. Not enough batter for size of pan. Oven too hot or too cool.	
Has spots on top crust -----	Utensils or storage area not sanitary; personnel not clean. Too many moisture-retaining ingredients. Cake underbaked. Cake stored improperly.	See paragraph 25.
Has off color (white fruit cake).	Sugar too coarse or not completely dissolved. Racks not clean. Too much invert sugar or malt sirup; acid content too low. Ingredients of poor quality or not properly prepared.	Make sure that flour and shortening are white. Use oil of spices instead of ground spices. Drain fruit thoroughly before using it.
Has poor color (dark fruit cake).	Sugar crystals rub metal from bowl during mixing. Cake baked improperly.	Cream shortening before adding any sugar.
Raisins on top of cake char --	Poor grade of molasses used. Acid content too high.	White fruit cakes will darken if baked too slowly.
Has poor flavor -----	Raisins not soaked properly. Cake overbaked; too much top heat in oven; lack of steam in oven. Too much flavoring or too little salt. Ingredients rancid or of poor quality. Ingredients not properly mixed.	

Table 6. *Faults in Cakes; Causes and Corrections*—Continued

Faults	Causes	Remarks
Has poor keeping quality	Baking pan not clean; pan grease rancid. Cake overbaked. Cake stored improperly. Too much leavening or not enough sugar or shortening. Incorrect amount of moisture-retaining ingredients.	When humidity is low, cakes dry out rapidly; it may be necessary to add moisture-retaining ingredients to formula.
Center peaks	Batter overcreamed. Cake baked too long in oven that is too cool. Formula too lean, or egg content too high.	Increase amount of sugar and shortening, or use fewer eggs and increase amount of milk and leavening.
Crust peels off	Fruit not soaked properly. Batter overmixed or undermixed. Batter too stiff. Oven temperature too high. Too much sugar or shortening. Batter overcreamed. Too much steam in oven.	Add moisture.
Fruit sinks to bottom of cake.	Too much leavening or not enough eggs.	Too much leavening causes cake to rise and form a structure that cannot hold the weight of the fruit. Use more eggs in the recipe to strengthen cake structure. When egg content is increased, the amount of milk and leavening must be decreased.
Bakes unevenly	Fruit not properly prepared. Batter overcreamed or too soft. Oven temperature too low. Ingredients mixed improperly. Oven heat uneven (too much top or bottom heat or hot spots).	Fruit must be soaked, drained thoroughly, and cut into small pieces. Follow mixing procedure in recipe and make sure that ingredients are mixed thoroughly.

Section III. FINISHING

88. General

Frostings, icings, toppings, and fillings add flavor and eye appeal to the cakes on which they are used. Frosting or icing also improves the keeping quality of the cake by retarding the loss of moisture. A cake should be frosted or iced as soon as possible after it is cool, because it is at this point that the cake contains its maximum amount of moisture. If a cake is

frosted while it is still warm, moisture may condense between the crust and the frosting, and soaking is likely to occur.

a. Frostings and Icings. The terms "frosting" and "icing" generally are used interchangeably, but there is a slight difference. Frosting is used only on cakes; it may be uncooked and is thicker than icing. Fudge frosting is an example of the cooked type;

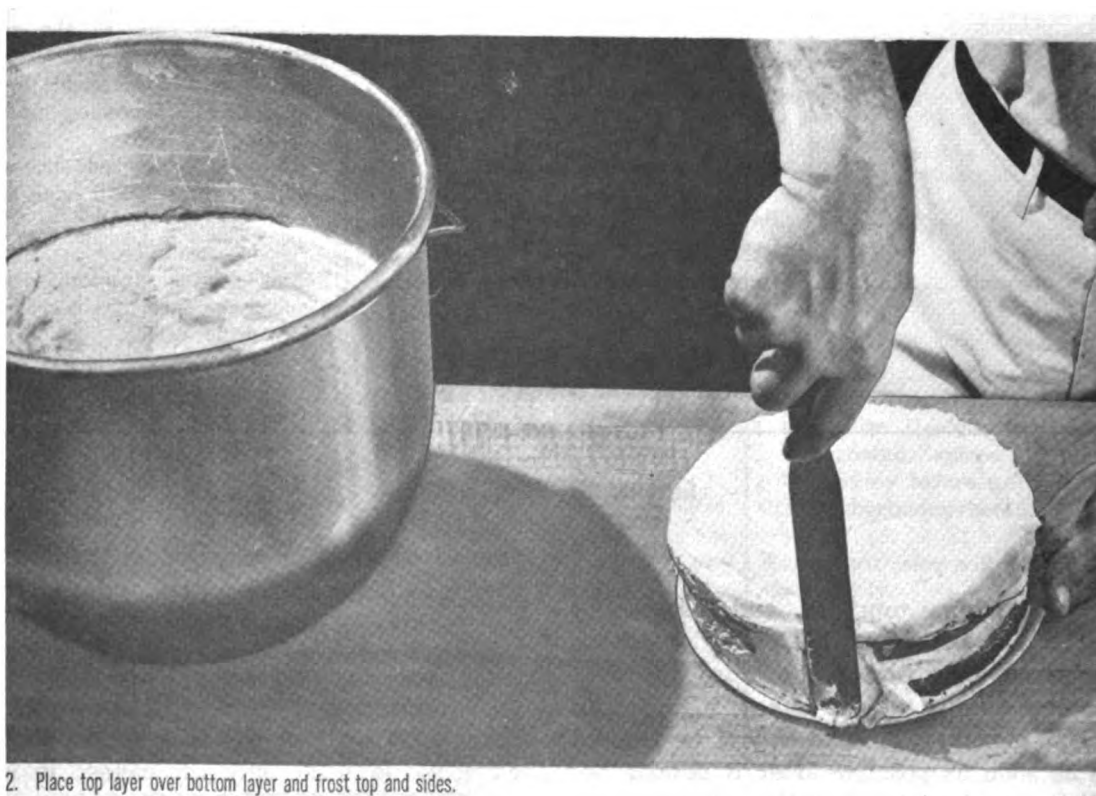
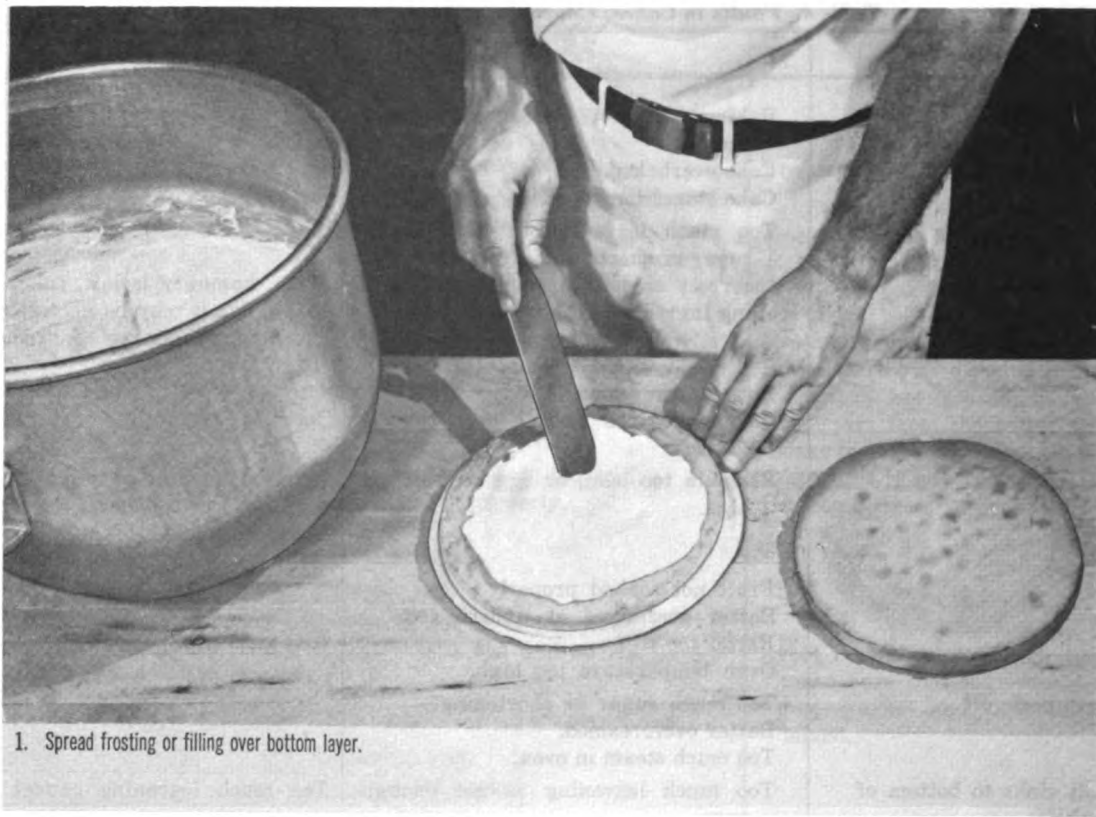
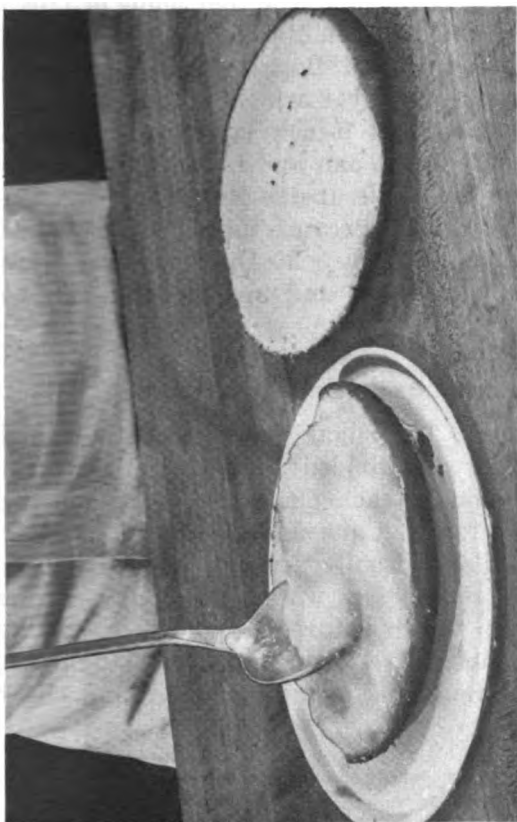


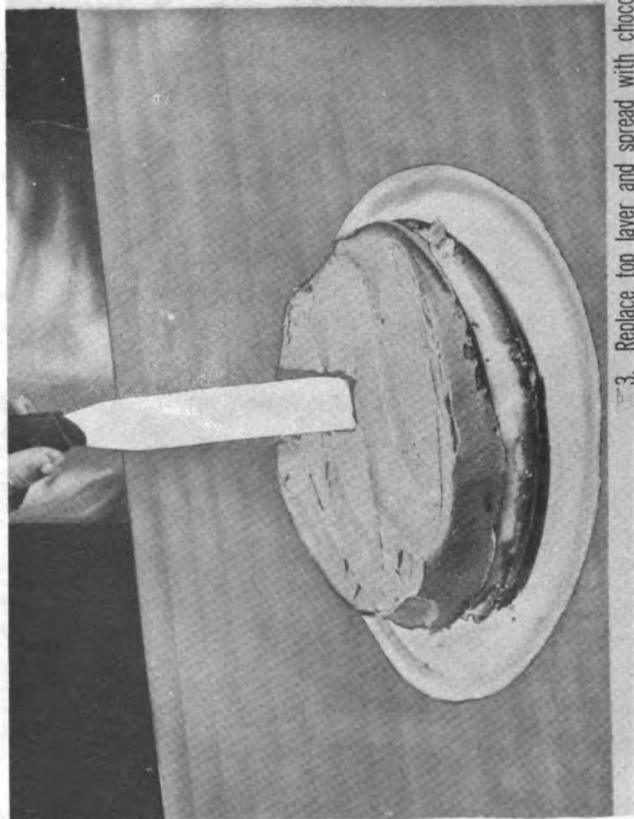
Figure 26. Finishing a 9-inch layer cake.



1. Split 9-inch layer to form two thin layers.



2. Spread cream filling over bottom layer.



3. Replace top layer and spread with chocolate frosting or sprinkle with powdered sugar.

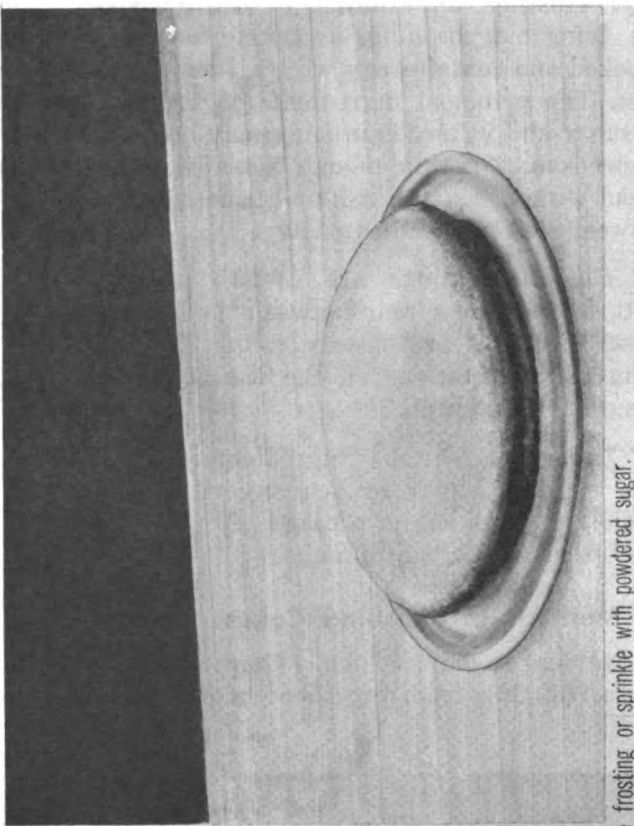


Figure 27. Preparing Boston cream pie.

butter frosting, an example of the uncooked type. Icing may be fluffy or thin. Fluffy icing is cooked and contains egg whites. It is used on cakes. The principal ingredients of thin icing are sugar and water. Thin icing may be cooked or uncooked; it is thin enough to be drizzled or spread with a pastry brush and usually is used on sweet rolls and danish pastry.

b. Fillings. Fillings are cooked thickened mixtures that are spread between the layers of cakes. Examples are custard filling and fruit filling. For limitations on the use of custard filling, see paragraph 7b.

c. Toppings. Various ingredients such as nuts, coconut, sugar or semisweet chocolate, which are sprinkled on a cake before or after it is baked, are called toppings.

89. Methods of Finishing Cakes

Layer cakes may be made from two 9-inch layers (fig. 26), from two sheet cakes, or from

one sheet cake cut in half; either filling or frosting is spread between the layers, and the top and sides are frosted. Boston cream pie is made from one 9-inch layer which is split (fig. 27) or from two thin 9-inch layers. Sheet cakes may be left in the pan and frosted only on top (fig. 28). Pineapple upside-down cake (fig. 29) needs no finishing because the topping is baked with the cake. Figure 30 shows several ways in which jelly roll and sponge cake can be finished.

90. Frosting and Icing Ingredients

a. Sugar. The sugar used in frostings and icings may be divided into several different classes, and in each class are sugars having different forms. Cane and beet sugars are in one class and usually are dry. Although they dissolve readily in water, they absorb the moisture; the moisture evaporates, and the sugars quickly re-form into crystals. Sirups, on the other hand, retain moisture and check

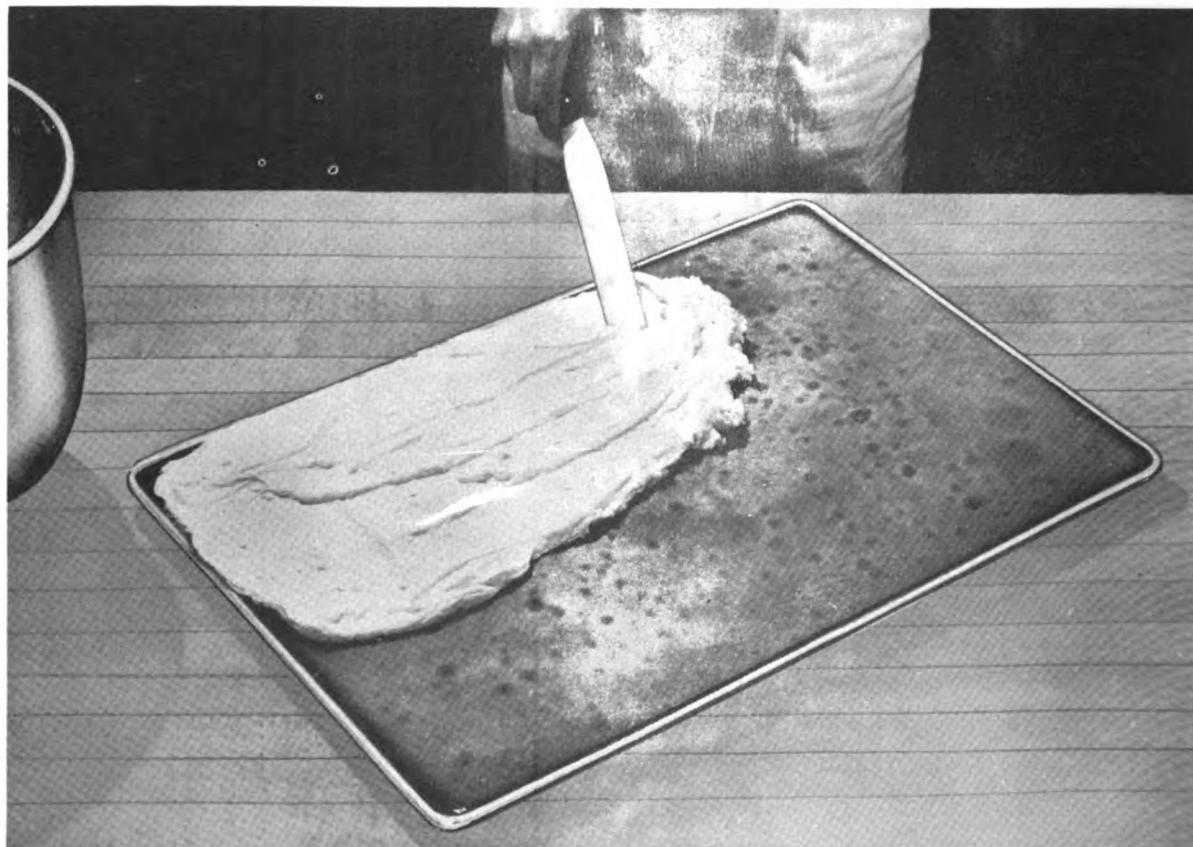
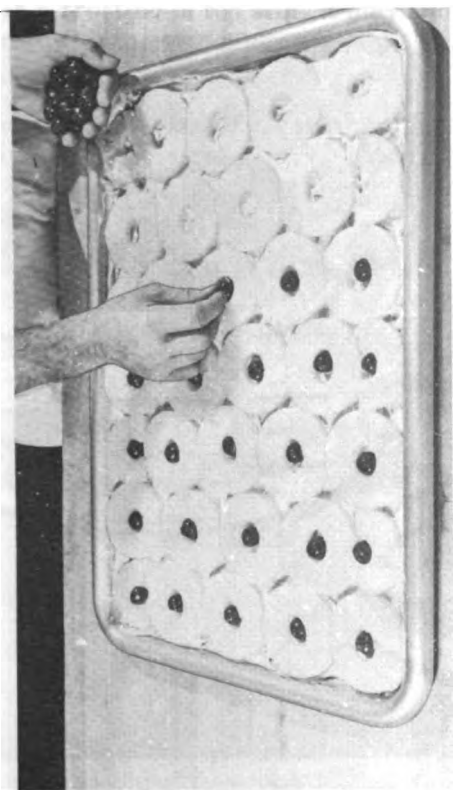


Figure 28. Frosting sheet cake in pan.



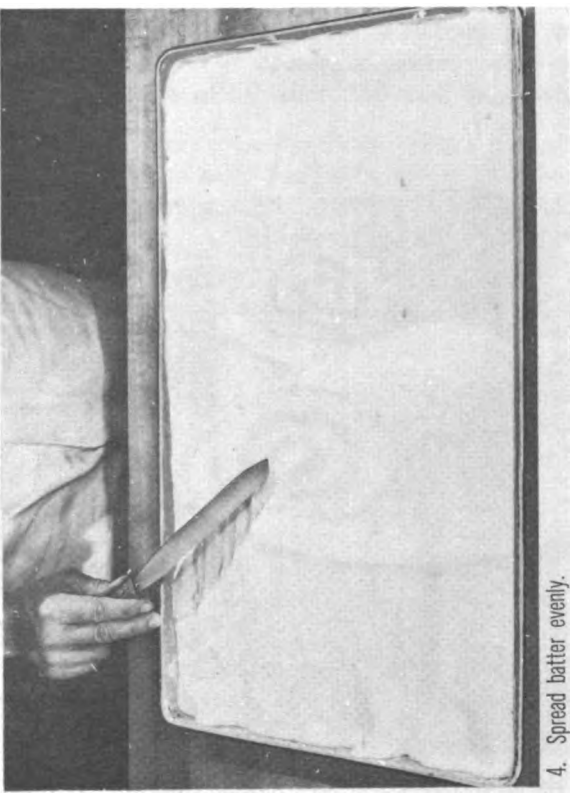
1. Spread butter and sugar mixture over bottom of pan.



2. Arrange fruit in pan.



3. Pour batter over fruit.



4. Spread batter evenly.

Figure 29. Preparing pineapple upside-down cake.



Figure 30. Finished jelly roll and sponge cake.

the drying process in baked goods. They also slow down the rate at which dissolved sugar returns to crystal form. Icings contain sirup in some form are smoother than those containing only dry sugar.

b. Shortening. In many frostings, shortening or butter is one of the most important ingredients. The shortening or butter should have good creaming properties (the ability of the fat to retain air and thus make the frosting light and fluffy). The more air creamed into the frosting, the greater the volume of the frosting. A light fluffy frosting often has better eating qualities than a heavy frosting.

c. Liquid. The liquid, which dissolves a portion of the sugar, serves as a binder to hold the frosting together. After the cake is frosted, the moisture evaporates, causing the frosting to dry. The sugar that has dissolved crystallizes and makes the grains already present larger and coarser. Sirup is often used to replace a portion of the liquid because the sirup checks drying and forces the sugar to form fine crystals.

d. Flavoring. A pleasing flavor in a frosting is very important. Often frostings are over-flavored or contain unpleasant flavors. The amount of flavoring used should be measured accurately.

e. Salt. Salt is an essential ingredient of most frostings and icings. It acts as a stimulant to the taste buds and brings out flavors that would otherwise pass unnoticed. Salt also tones down excessive sweetness in some frostings. In frostings containing salted butter, the amount of salt used must be reduced or the salt left out altogether.

f. Egg Whites. Egg whites are used in the production of boiled or marshmallow-type icings. When making this type of icing, the usual procedure is to heat the sugar and liquid to a temperature of 240° F. The heated sugar mixture is poured into egg whites that have been whipped to a wet peak. The whipping process is continued until the icing is smooth and firm enough to spread. Containers for egg whites should be clean and free from grease.

91. Methods of Thinning Frostings

If a frosting is too stiff, it may be thinned by adding water, by adding simple sirup, or by warming the frosting.

a. Adding Water. Frosting thinned with water will be slow to dry. This is due to the fact that the water must evaporate before the sugar will crystallize.

b. Adding Simple Sirup. Frosting thinned with simple sirup will dry faster than icing thinned with water because the ratio of water

to sugar has not been changed. Simple sirup can be made in the bakery by boiling 12 pounds of sugar with 4 pounds of water and 1/4 ounce of cream of tartar. This sirup can be made in advance and used as needed.

c. Warming Frosting. Some types of frosting, especially fudge frosting, may be warmed to a temperature of 90° to 100° F. A warm frosting will be more fluid and will spread more easily, yet the moisture content will not have been increased and the frosting will dry merely by cooling.

CHAPTER 7

COOKIES

Section I. INTRODUCTION

92. General

Cookies, in combination with ice cream, puddings, or fruit, are a good dessert. Because of their excellent keeping qualities, they may be made in advance of serving. Cookies are of two general types: Soft cookies and hard cookies. Characteristics of good soft cookies are moistness and softness; characteristics of good hard cookies are crispness and brittleness. Whether a cookie is soft or hard depends on the proportions of the four basic ingredients—flour, sugar, shortening, and liquid (milk and/or eggs)—used in the formula. Leavening agents, which are added to most cookies, have an effect on the size, color, and eating qualities. Other ingredients are added to provide flavor and texture. Soft (soft batter) cookies contain a maximum amount of moisture and may require a greater percentage of eggs to produce the necessary structure. Hard cookies contain a minimum amount of moisture.

93. Functions of Ingredients

a. Flour. Flour is the principal structure builder or binding agent in most cookie formulas and is considered to be a toughening ingredient. When flour is moistened, the proteins it contains develop into the main structure of the cookies. Hard wheat flour may cause certain types of cookies to lack spread, whereas soft wheat flour may cause some types to spread too much. Use the type of flour specified in the recipe.

b. Sugar. Some form of sugar is used in all cookie recipes. It is an important ingredient because the type and amount of sugar will determine to a large degree the type of cookie produced. Undissolved sugar crystals melt dur-

ing the baking process and contribute to the flow or spread of the dough.

- (1) *Granulated sugar.* The finer the granulation, the less spread the cookies will have.
- (2) *Powdered sugar.* Powdered sugar is used when a fine-grained, compact interior with little or no spread is desired.
- (3) *Brown sugar.* Brown sugar is used in certain cookies to obtain a different flavor and color.
- (4) *Molasses.* Molasses is used to obtain a particular flavor. Formulas containing molasses have to be adjusted to compensate for acidity and moisture differences.
- (5) *Honey.* Honey is also used to obtain a particular flavor. Honey adds a chewy quality to cookies and helps to give a darker crust color.

c. Shortening. Shortening promotes tenderness in the product and, because it acts as a lubricant, prevents excessive gluten development. Without shortening, cookie dough would be tough and rubbery; and the finished product would be dry and would lack good eating qualities. Shortening also contributes to the spread of the cookies. Regular hydrogenated shortenings with a bland flavor are most commonly used, but margarine and butter are sometimes used because they give a more desirable flavor to some types of cookies.

d. Eggs. Whole eggs or the whites or yolks are used in cookies, depending on the recipe. Whole eggs contribute to the structure of the cookies. Egg yolks, because of their fat content, contribute both structure and tenderness. Egg whites, because of the protein they con-

tain, act as structure builders. Both whites and yolks contribute moisture to cookies.

e. Liquids. Liquid, in one form or another, makes up a portion of many cookie formulas. Water is necessary to moisten the protein so that the structure of the cookies can be formed. Water partly controls dough consistency; however, it must not be assumed that dough too stiff to handle can be softened by adding water. This type of corrective measure quite often results in tougher cookies with less spread.

f. Milk Solids. Milk solids tend to exert a binding action on doughs. Their toughening effect is slight because they constitute a small part of the total cookie ingredients. Milk solids, in proper proportions, are a valuable addition to many cookie recipes because they provide nutritional value. Also, the milk sugar adds to the richness of the crust color.

g. Leavening Agents. Leavening helps to control the spread or size of cookies, produces volume and lightness, and helps to control flavor and to promote proper color through regulation of the acidity or alkalinity of the dough. Cookies that are dropped by hand, by machine, or with a pastry tube usually require the spread control provided by leavening agents.

- (1) *Baking soda.* Bicarbonate of soda, an alkali salt, can be added alone or as a component of baking powder. The alkalinity of baking soda lowers the caramelization point of sugar in the formula, causing faster and darker coloring of the crust. Soda has a weakening effect on flour protein, and this action is more pronounced when soda is used without a counteracting food acid. Some of the alkalinity of the soda is neutralized by the natural

acidity of the other ingredients in the formula. The use of too much soda will cause the product to have a soapy taste.

- (2) *Cream of tartar.* Cream of tartar, a baking acid, is used with soda as a leavening agent. When used without a counteracting alkali, cream of tartar increases the acidity of the dough or batter. This higher acidity gives a much whiter crumb and a lighter crust color to the finished product because sugar caramelizes at a higher temperature in an acid medium.
- (3) *Baking powder.* Baking powder is a mixed blend of food acids, bicarbonate of soda, and a filler. This mixture, in the presence of heat and moisture, produces a carbon dioxide gas.

h. Flavoring Agents.

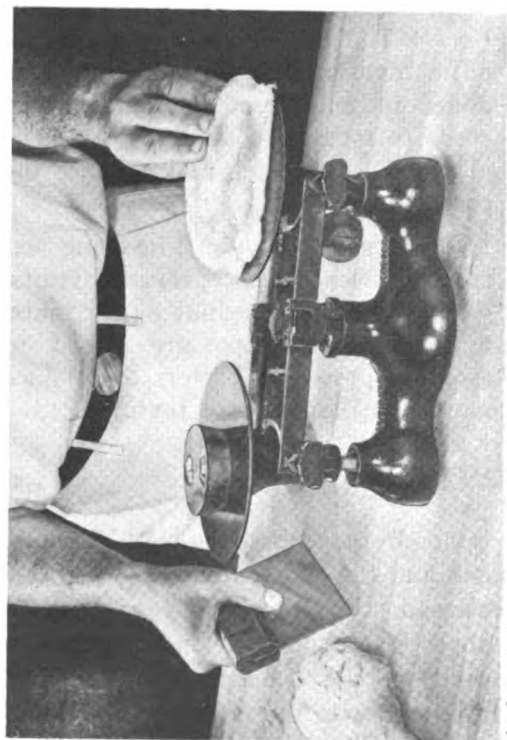
- (1) *Salt.* Salt is used for its own flavor and is also used to bring out the natural flavors of the other ingredients. The salt requirement must be adjusted when salted butter is used in a recipe.
- (2) *Cocoa.* The use of cocoa requires an adjustment in the formula. Sugar is added to counteract the tendency of cocoa to toughen cookie dough and is also used to sweeten and enhance the cocoa flavor.
- (3) *Miscellaneous flavors.* Flavoring extracts, juices, spices, prepared fruits, oatmeal, coconut, peanut butter, nuts, and chocolate chips are added to cookie doughs and batters to produce particular flavors and textures.

Section II. PREPARATION

94. Mixing Methods

a. One-Stage Method. The one-stage method is preferred because its simplicity reduces the possibility of error. The dry ingredients are sifted together twice; then all of the ingredients, both wet and dry, are put in the mixing bowl and mixed at slow speed until they form a smooth dough.

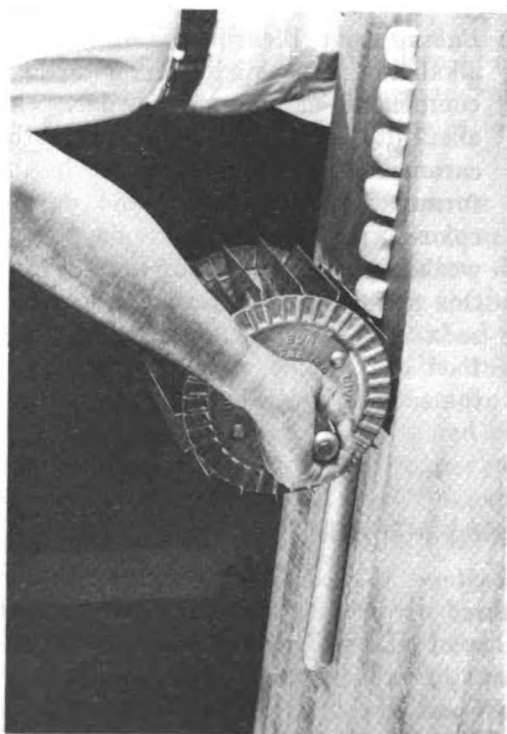
b. Creaming Method. In this method, most of the sugar and the shortening, salt, and flavoring are creamed together. The eggs are then added in three stages, and the ingredients are mixed until smooth after each addition. The liquids are stirred into the mixture. The flour, baking powder, and remaining sugar are sifted together and added. In this type of mixing, the



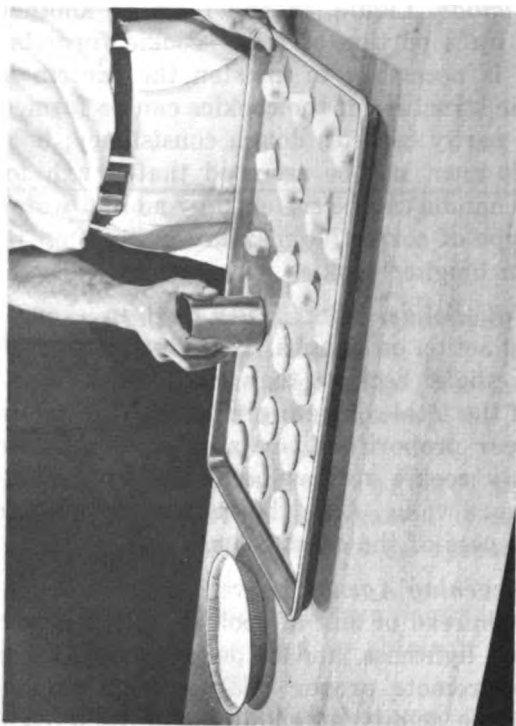
1. Scale dough.



2. Roll dough into cylinder.



3. Cut cylinder into small pieces, either with a squirrel cage cutter or by hand.



4. Place pieces on baking sheet and flatten.

Figure 31. Making up stiff-dough cookies.

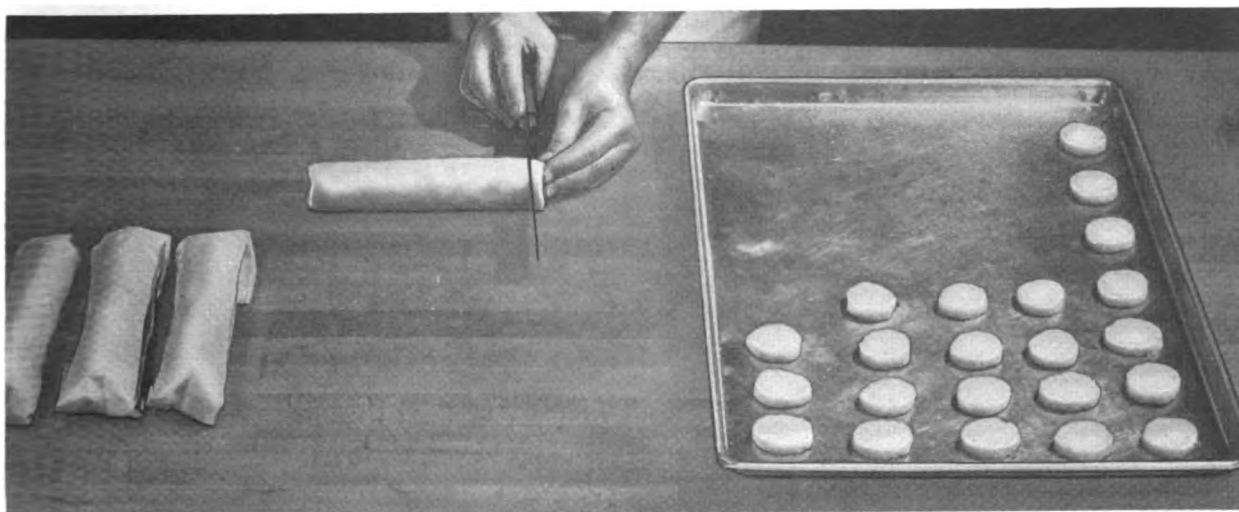


Figure 32. Slicing icebox cookies.

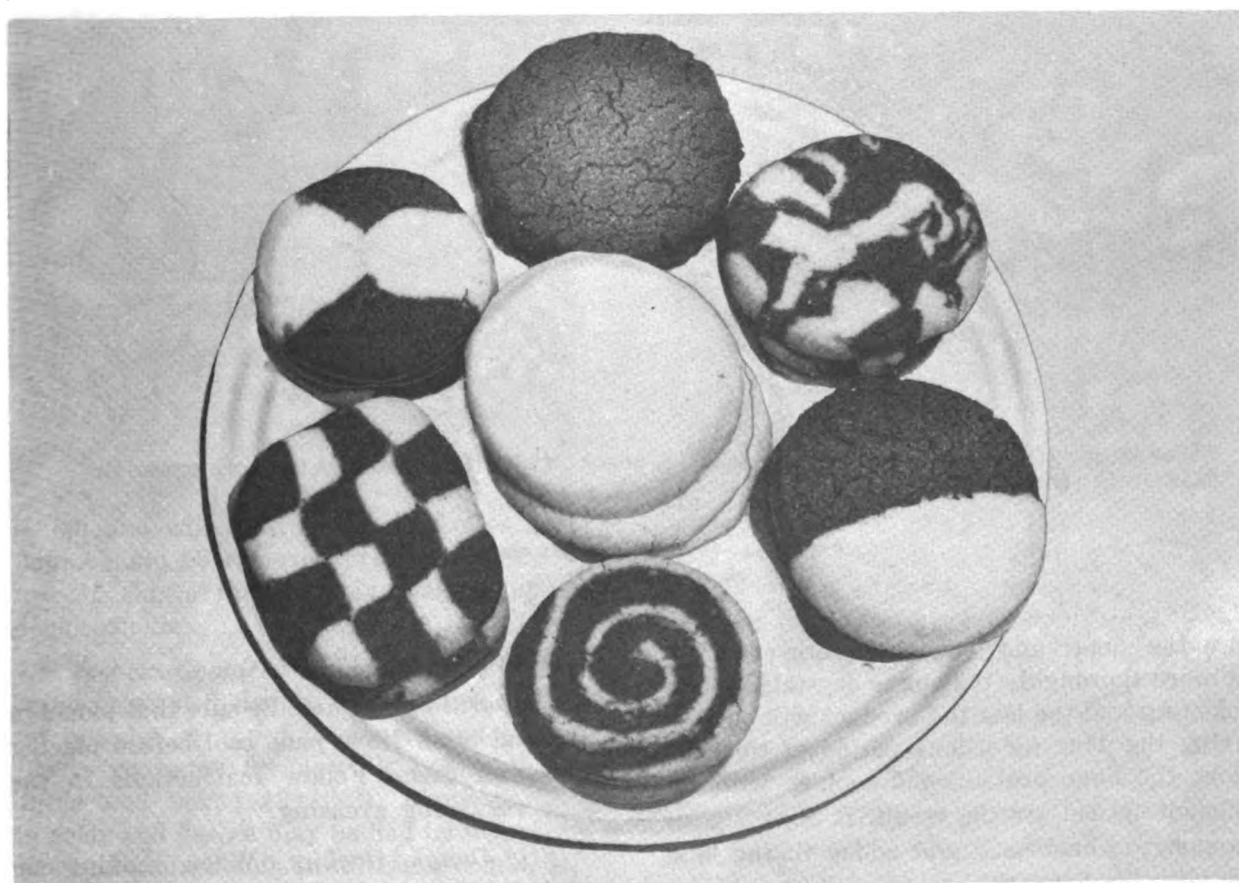
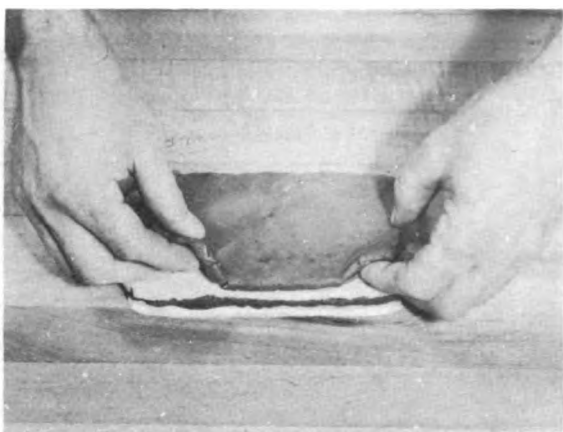
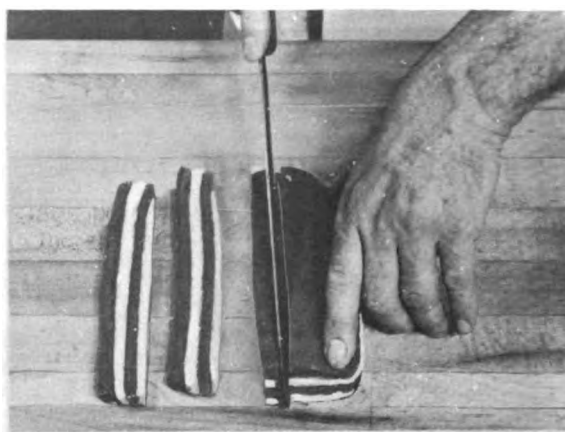


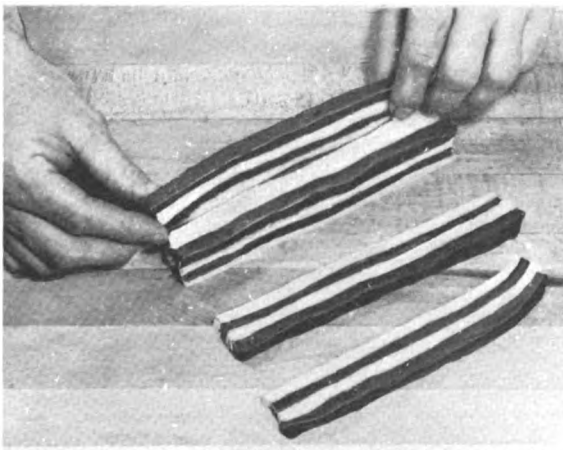
Figure 33. Icebox cookies made from plain and chocolate dough.



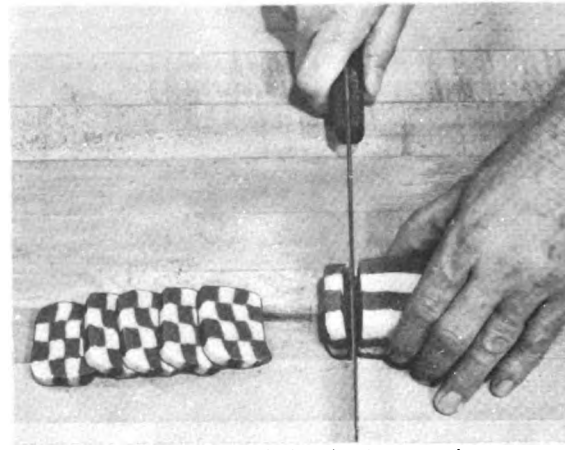
1. Roll two pieces of plain dough and two pieces of chocolate dough to about 3/8-inch thickness. Brush tops of three of the pieces with water; then stack, alternating the plain and chocolate layers. (Place layer that has not been washed on top.)



2. Cut the four layers of dough into strips approximately 1/2 inch thick; then brush cut surface with water.



3. Place four strips of dough together so that the colors alternate; then wrap dough in waxed paper and chill in the refrigerator.



4. Slice cookies 1/4 inch thick; then place in ungreased pan.

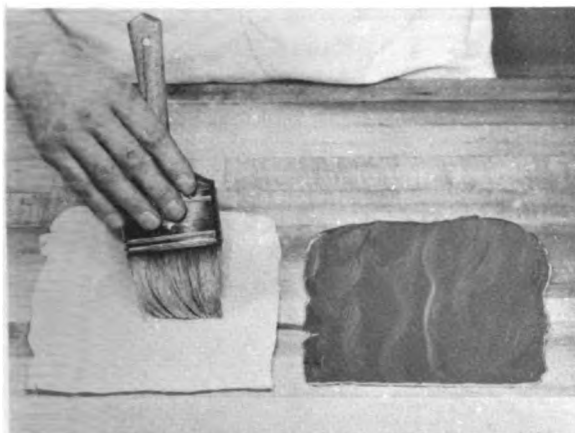
Figure 34. Preparing icebox cookies in checkerboard design.

more the sugar and shortening are creamed, the more thoroughly the sugar crystals will be broken up and the less the product will spread. Mixing the flour for a long period of time develops the flour protein, and cookies with insufficient spread are the result. If a portion of the sugar is held back and added in the final step with the flour, the cookies will have better spread. Nuts, raisins, or chocolate chips may be added at the end of the mixing period and should be mixed only until they are incorporated in the batter.

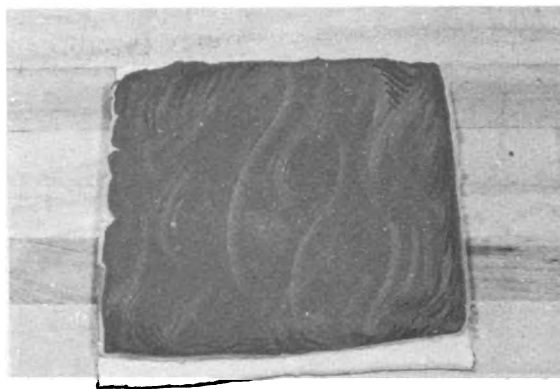
95. Makeup

a. Preparation of Pans. Be sure that pans are clean and level. Have pans cool before placing cookies on them. Follow instructions in the recipe regarding greasing.

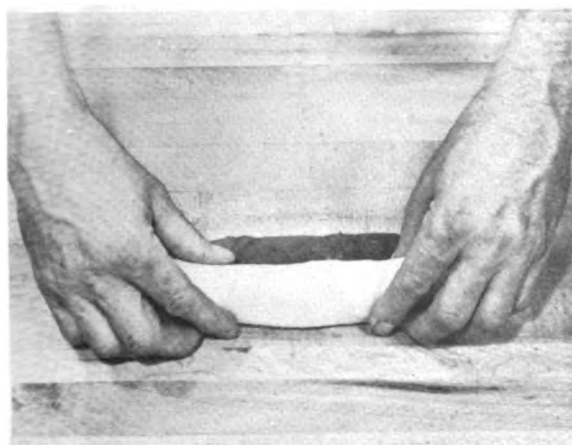
b. Stiff-Dough Cookies. When making up stiff-dough cookies, handle the dough as little as possible. Excess working of the dough will cause the product to be tough. Use a minimum of dusting flour because the dough will absorb the flour; this will have a binding effect on the



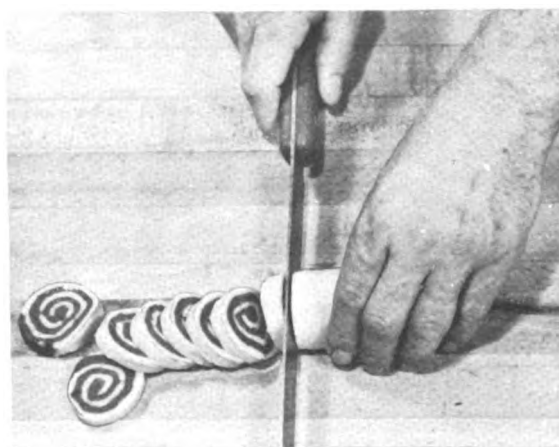
1. Roll one piece of plain dough and one piece of chocolate dough to 1/4-inch thickness. Make one piece about 1/2 inch longer than the other. Brush longer piece with water.



2. Place shorter piece of dough on top of the other.



3. Roll layers together as for jelly roll; then wrap in waxed paper and chill in refrigerator.



4. Slice cookies 1/4 inch thick; then place in ungreased pan.

Figure 35. Preparing icebox cookies in pinwheel design.

dough and will retard spread. Excess dusting flour should be removed prior to baking. Figure 31 shows the steps in making up stiff-dough cookies.

c. Icebox Cookies. Icebox cookies are also made from stiff dough. The cookies are made up in rolls, wrapped in paper, and placed in the refrigerator for a while before they are sliced and baked (fig. 32). Many variations in color and design may be had by using chocolate and plain dough in different combinations (fig. 33). Figures 34 and 35 show the steps in making cookies in the checkerboard and pinwheel designs. Icebox cookies made up for baking should not be kept at room temperature longer than is necessary.

d. Bar Cookies. Figure 36 shows the method

of making up bar cookies, which are also made from stiff dough.

e. Soft-Batter Cookies. Soft-batter cookies may be dropped by hand (A, fig. 37) or from a spoon or size 30 ice cream scoop onto a sheet pan. This type of batter may also be squeezed from a pastry bag (B) or paper cone or dropped by machine. Care must be taken to keep the size uniform and to space the cookies properly on the baking sheet.

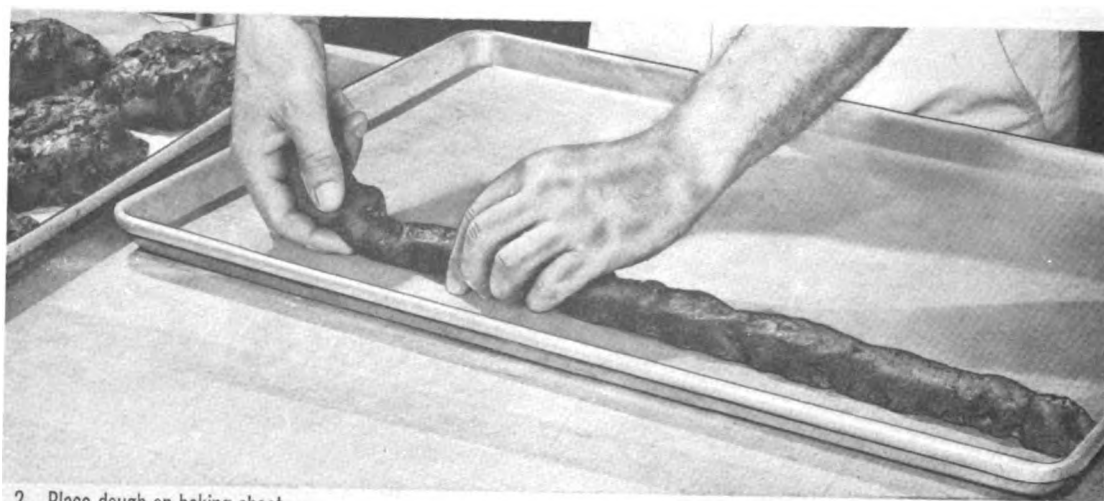
f. Brownies. Brownie batter is placed in a greased sheet pan and spread to a uniform thickness.

96. Baking and Cooling

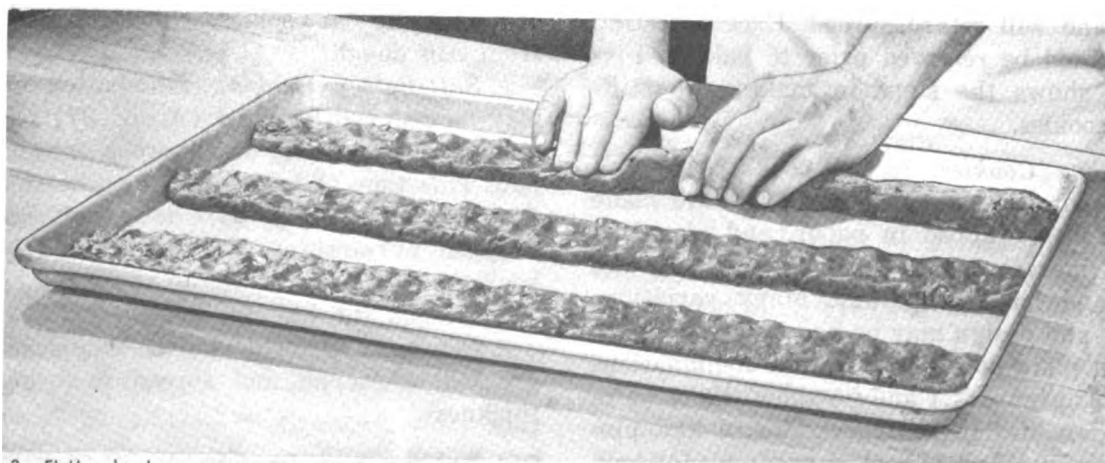
a. Baking. Follow the baking time and temperature specified in the recipe. If the oven is too hot, the cookies may lack spread. If the



1. After scaling dough, roll into a cylinder.

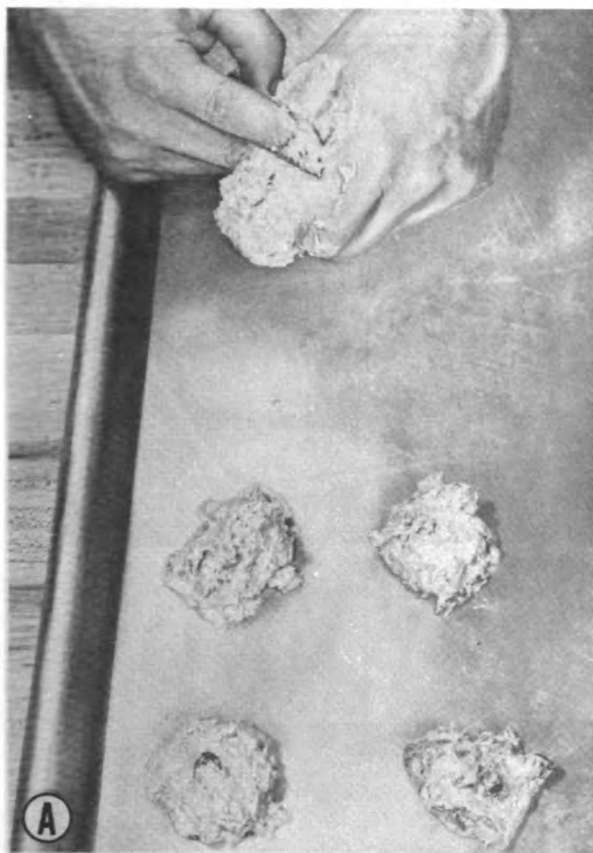


2. Place dough on baking sheet.



3. Flatten dough.

Figure 36. Making up bar cookies.



Dropping cookies by hand.



Dropping cookies with pastry bag.

Figure 37. Dropping soft-batter cookies.

oven is not hot enough, the cookies may spread excessively. Watch carefully, for a slight overbaking will overcolor the cookies and ruin their flavor. Chocolate cookies burn easily. When cookies are done, they will be of the proper color.

b. Cooling. To minimize breaking, loosen cookies (A, fig. 38) while they are still warm; then remove from pan. Cut bar cookies before removing them from the pan (B). Mark top of brownies in 2-inch squares while they are still hot. Finish cutting the squares after the brownies have cooled. Do not stack cookies while they are still warm. To keep the surface from cracking, allow cookies to cool gradually.

97. Finishing

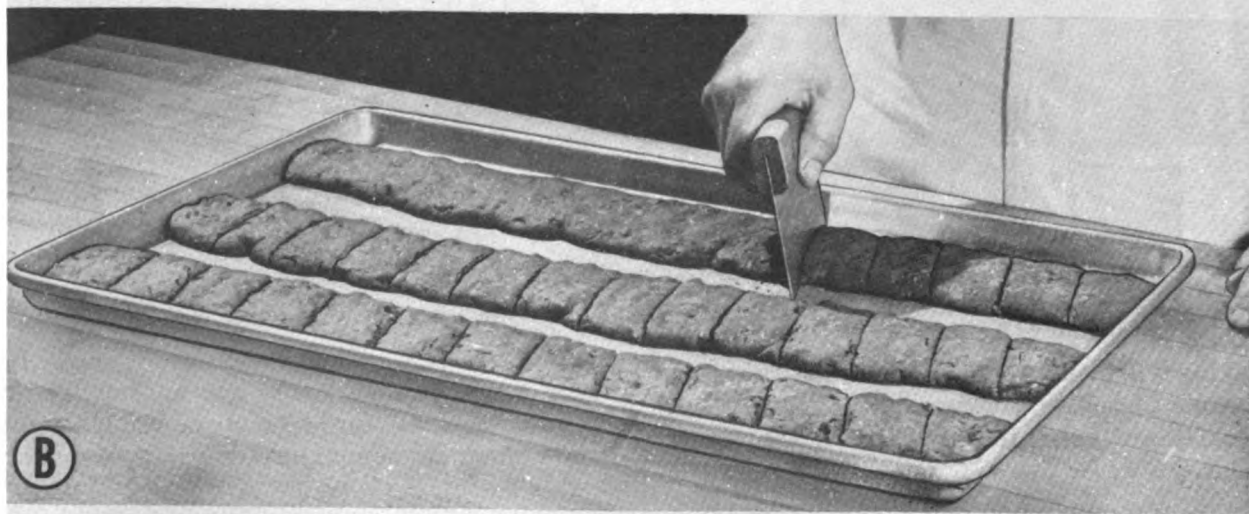
Icing cookies is not necessary, though in some cases icing may add eye appeal. Ice or garnish cookies for special occasions with white icing, cinnamon, nuts, raisins, or similar ingredients.

98. Faults in Cookies

Table 7 lists faults that might occur in cookies, together with possible causes of the various faults. The "Remarks" column gives some suggestions for correction of the faults, as well as other information that may be of value to the baker.



Loosening cookies.



Cutting bar cookies.

Figure 38. Care of cookies after they are removed from the oven.

Table 7. Faults in Cookies; Causes and Corrections

Faults	Causes	Remarks
Lack spread -----	Wrong type of sugar.	Use a sugar of regular granulation which will not dissolve readily during mixing. <i>Note.</i> Should finely granulated sugar or powdered sugar be used where spread is desired, the bulk of the sugar may be dissolved in the mixing stage, leaving little to be dissolved during baking.

Table 7. *Faults in Cookies; Causes and Corrections*—Continued

Faults	Causes	Remarks
Spread excessively -----	Wrong type of flour.	Bread flours are not suitable for making cookies needing spread.
	Too much binding material.	Amounts of binding ingredients in the formula (flour, moisture, milk solids, and cocoa) should be either reduced or offset by an increase in one or more tenderizing materials (sugar, shortening, egg yolks, and leavening material).
	Not enough leavening, or wrong type.	
	Batter or dough mixed improperly.	Avoid overcreaming sugar, shortening, etc. Avoid overmixing batter or dough after flour and other ingredients are added in last stage.
	Pan not properly prepared.	Grease pan lightly for best results.
	Dough overworked, or too much scrap dough used.	Cut cookies carefully to reduce scrap dough; handle dough as little as possible.
	Too much dusting flour.	Dough absorbs dusting flour during makeup; flour has a binding effect on dough and retards spread.
	Cookies washed with wrong type of wash.	Egg washes containing a high percentage of eggs set rapidly during baking and prevent cookies from spreading properly. Desired spread can be obtained if cookies are washed lightly with milk, sour cream, sugar and water, or light egg wash.
	Oven too hot.	
	Wrong type of sugar.	Use fine granulated sugar or powdered sugar when little or no spread is desired.
Poorly shaped -----	Wrong type of flour.	Use bread flour when spread is not desired.
	Too much tenderizing material.	Too much sugar, shortening, egg yolk, and leavening may cause excessive spread. Correct this condition by increasing the percentage of one or more of the binding materials.
	Too much leavening, or wrong type.	Baking powder is the leavening agent most often used in cookies of the no-spread variety. Too much baking soda will cause excessive spread because it has a weakening effect on the flour proteins.
	Cookies deposited in warm pan.	
	Too much pan grease.	When it is necessary to grease pan, grease lightly and then dust with flour to retard spread. Many no-spread types of cookies may be baked on ungreased pans.
	Oven too cool.	
	Dull or bent hand cutter used.	

Table 7. *Faults in Cookies; Causes and Corrections*—Continued

Faults	Causes	Remarks
Break during handling -----	Wire cutter of wrong gage used.	A heavy gage wire should be used to cut cookies containing raisins or other ingredients that are difficult to cut.
	Pan bent or dented.	
	Not enough space in pan for spreading.	
	Oven temperature too hot or too cool.	
	Formula too rich in shortening.	When formula contains comparatively large amounts of shortening, it is recommended that bleached cake flour be used to offset the effect of the shortening.
Have off-flavor -----	Lack of structure-building materials.	Formula may require more eggs or flour.
	Too much sugar.	The use of too much sugar may cause cookies to stick to the pan and break when removed from pan.
	Lack of pan grease.	
	Lack of moisture-retaining ingredients.	Sufficient amounts of honey, brown sugar, and molasses must be used.
	Cooled too rapidly.	Allow cookies to cool gradually.
Have poor keeping qualities ----	Oven too cool.	
	Ingredients faulty.	Most ingredients used in cookies absorb the odors of other ingredients and may impart these flavors to the finished product. Use ingredients that have been stored properly. Use flavoring of high quality.
	Baking pan dirty.	If cookie pans are not washed and rinsed well, pan grease in pores of the metal will become rancid and will affect the flavor of the cookies.
	Overbaked.	
	Too much leavening, or wrong type.	
	Lack of moisture-retaining ingredients.	Use ingredients such as honey, molasses, and brown sugar to prolong the keeping qualities.
	Batches overaerated.	Overaerated batches may produce open-grained cookies which tend to dry out and become stale quickly.
	Cookies stored improperly.	See paragraph 25.

CHAPTER 8

QUICK BREADS

Section I. INTRODUCTION

99. General

Quick breads, which are leavened by baking powder or baking soda, include cornbread and various types of biscuits and muffins. Biscuits are made from dough; muffins and cornbread are made from batter. Dough contains more flour than liquid and is of a consistency that can be kneaded and rolled. Batter is of a softer consistency than dough and can be poured, panned by hand, or dropped from a spoon. Because quick breads (fig. 39) should always be served hot, they are baked at unit mess level just prior to serving.

100. Functions of Ingredients

a. Flour. Flour provides most of the structure for quick breads. This is especially true

of breads that do not contain eggs. Hard wheat flour generally is recommended for making quick breads.

b. Liquids. Liquids (mainly water, liquid milk, or eggs) perform several functions in quick breads. Liquid, in addition to controlling the consistency of the dough or batter, makes possible the formation of gluten, dissolves the sugar, and makes possible the chemical reactions of the leavening agents.

c. Eggs. Eggs are used in batters. They are structure builders and contribute flavor, color, and food value.

d. Sugar. Sugar is not an essential ingredient of all quick breads; however, it is used in some varieties to give additional sweetness. In



BISCUITS



MUFFINS

Figure 39. Two examples of quick breads.

addition to softening the protein and acting as a tenderizer, sugar helps to produce the golden brown crust color.

e. Shortening. Shortening is an internal lubricant in quick breads and helps to make the product tender. It also adds to the nutritional value.

f. Salt. Salt is used primarily for flavor, but it also helps to strengthen the proteins in the flour.

g. Leavening. Some form of leavening is necessary in all quick breads. Baking powder is the leavening agent most commonly used; but baking soda, combined with an edible acid such as vinegar or sour milk, may also be used. The carbon dioxide gas given off when soda and an acid react together is confined by the structure-building ingredients, causing the batter or dough to rise. In the preparation of biscuits, the air folded into the mix when the dough is kneaded helps to increase the volume of the finished product.

Section II. PREPARATION

101. Mixing

a. Dough. In the preparation of biscuit dough, the shortening is blended with the dry ingredients, and the liquids are then added to the mixture. If the dry ingredients and shortening are overblended, the product will be too tender. If the liquids and dry ingredients are overmixed, the product will be tough. It is advisable to cut the shortening into the dry ingredients or to rub the shortening and dry ingredients together very lightly with the fingers; flour particles that are coated with too much fat will resist absorbing the moisture necessary for proper mixing. The liquid and dry ingredients should be mixed only until all ingredients are incorporated.

b. Batters. In cornbread batter and in most muffin batters, melted shortening is used. The melted shortening and liquids are combined and then are stirred into the dry ingredients. Properly mixed batter will appear to be lumpy and undermixed; however, as long as no dry ingredients are visible and the moisture is thoroughly distributed, the batter is properly mixed.

102. Makeup

a. Biscuit Dough. Make up biscuits as follows:

- (1) Place dough on a bench that has been dusted with hard wheat flour.
- (2) Divide dough into four pieces of approximately equal size.
- (3) Knead one piece of dough at a time. To knead the dough, flatten and fold

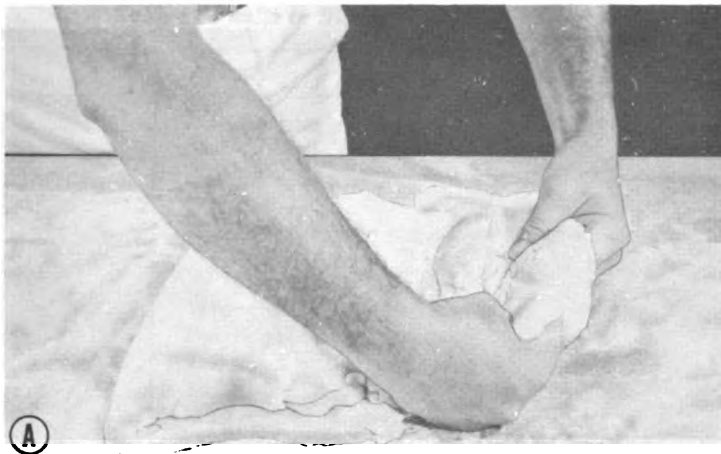
two or three times (A, fig. 40). Proper kneading will give more volume and will help to insure a uniform product.

- (4) Roll the dough to a 1/2-inch thickness (B).
- (5) Cut the dough with a 2 1/2-inch cutter. Be sure that the cutter is sharp; a dull cutter will pinch the edges of the dough and leave an uneven product. Place biscuits in an ungreased or lightly greased sheet pan in rows of 6 and 9 (C).
- (6) Add leftover pieces of dough to the next piece of dough and repeat (3) through (5) above.

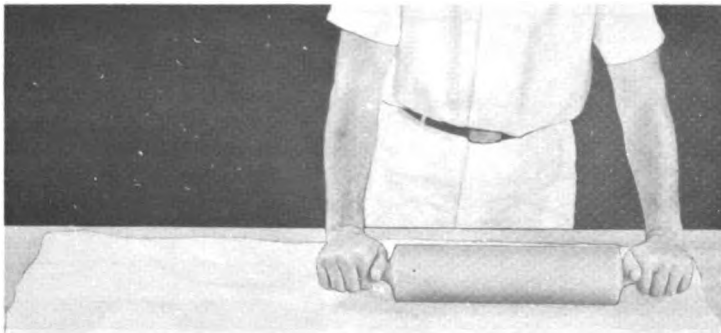
b. Batters. Place muffin batter in well-greased muffin tins, either by hand (fig. 41) or with a spoon. Fill muffin tins approximately two-thirds full. Pour cornbread batter into a well-greased sheet pan.

103. Baking

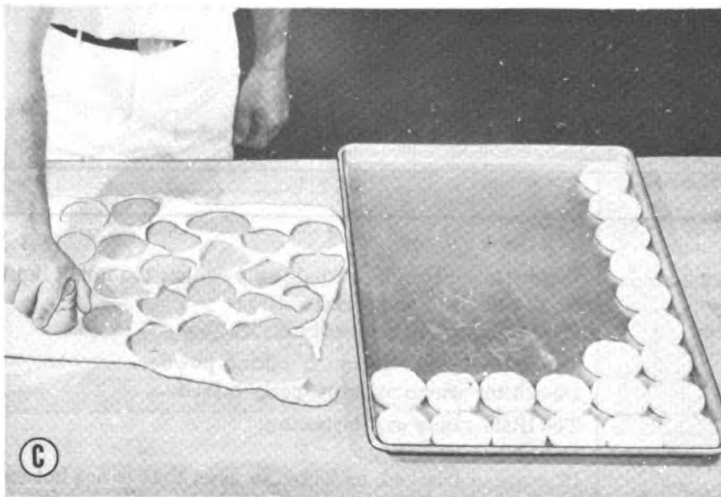
It is important that quick breads be baked at the proper oven temperature and for the proper length of time. Breads that are overbaked or baked in an oven that is too hot will become dry and too brown; breads that are underbaked or baked in an oven that is not hot enough will have a pale crust color. If muffins are baked in an oven that is too hot, they will peak or have an otherwise irregular shape; if baked in an oven that is not hot enough, they will be crumbly. Follow the baking time and temperature specified in the recipe.



Kneading dough.



Rolling dough to 1/2 inch thickness.



Cutting and panning biscuits.

Figure 40. Making up biscuits.



Figure 41. Panning muffins by hand.

104. Faults in Quick Breads

Table 8 lists faults that might occur in biscuits and muffins, together with possible causes

of the various faults. In all cases, the action to be taken to correct the fault is obvious.

Table 8. Faults in Biscuits and Muffins

Faults	Causes
BISCUITS:	
Have tough crumb	Too little shortening or baking powder; too much liquid. Dough too cold or overmixed. Baking temperature too low.
Have coarse crumb	Too little liquid; too much baking powder. Dough too warm or improperly mixed.
Lack moisture	Too little sugar or shortening. Dough too stiff. Biscuits overbaked, or baked in oven that is not hot enough.
Are flat and heavy	Incorrect proportions of ingredients. Dough too stiff, too cold, or not mixed properly. Oven temperature too low.

Table 8. *Faults in Biscuits and Muffins*—Continued

Faults	Causes
Have hard crust -----	Biscuits overbaked or baked in oven that is too hot.
Have crumbly texture -----	Too much sugar, too much baking powder, or not enough liquid.
Have pale crust -----	Too little sugar.
	Dough too stiff.
	Oven temperature too low.
MUFFINS:	
Have tough crumb -----	Wrong proportions of ingredients (particularly lack of sugar or shortening).
	Batter overmixed.
Lack moisture -----	Too much baking powder; too little sugar or shortening.
	Batter too stiff.
	Muffins overbaked.
Have holes or tunnels -----	Not enough liquid or shortening.
	Batter overmixed.
Have heavy, uneven grain -----	Insufficient leavening (causes muffins to be heavy).
	Insufficient shortening (causes heavy, uneven grain).
Muffins peak -----	Batter too stiff.
	Batter overmixed.
	Pans filled too full.
	Oven too hot.
Brown unevenly -----	Improper proportions of ingredients.
	Batter not mixed thoroughly.
	Oven temperature uneven or too high.
Have poor flavor -----	Too much soda.
	Batter mixed improperly.

CHAPTER 9

ROLLS

Section I. INTRODUCTION

105. General

A wide variety of soft rolls (fig. 42), hard rolls (fig. 43), and sweet rolls (fig. 44) can be made from yeast doughs. Hot rolls, either plain or sweet, add a great deal to any meal. The production of items from a yeast dough is no more difficult than the production of other types of pastry, but preparation time is longer because of the fermentation time required. It is important to set a schedule for roll production to in-

sure that the rolls are ready to serve with the rest of the meal. Operations must be carefully planned; once ingredient mixing has begun, the process cannot be interrupted without damage to the finished product. The production schedule must be based on the capacity of the ovens because oven space must be available when the product has reached the proper stage of proofing. Table 9 shows a typical schedule for roll production.

Table 9. Typical Schedule for Preparing Yeast-Raised Goods for a Specific Serving Time

Desired serving time: 1145

Procedures for production	Starting time	Procedure time
Start mixing dough -----	0900	10 min.
Time for dough to come from mixer -----	0910	
Total fermentation time -----		90 min.
Time to take dough for makeup -----	1040	
Makeup time -----		30 min.
Time in proofing cabinet -----	1110	20 min.
Time in oven -----	1130	15 min.
Ready for serving -----	1145	

Note. Times shown are a guide. Fermentation time, proofing time, and baking time may vary.

106. Functions of Ingredients

a. Wheat Flour. Wheat flour is essential to the production of satisfactory rolls because no other grain contains the proper combination of proteins to form gluten. Gluten, a tough elastic substance, forms the structure of rolls and provides the necessary strength and adhesiveness to retain the leavening gas. Leavening gas causes the dough to rise and gives the rolls volume. Hard wheat flour is desirable for the preparation of rolls because of its high gluten-forming protein content.

b. Water. Water is important in yeast-raised

doughs because it furnishes the medium needed by the proteins present in the flour to form gluten. During the mixing process, water dissolves ingredients such as sugar and salt; it serves as a yeast-dispersing agent and dissolves the food necessary to promote yeast activity; and it helps to regulate dough consistency and temperature.

c. Yeast. Yeast (par. 51) is the leavening agent used in bread and rolls. Besides conditioning the dough, yeast contributes to the flavor of the product. The leavening action of yeast is

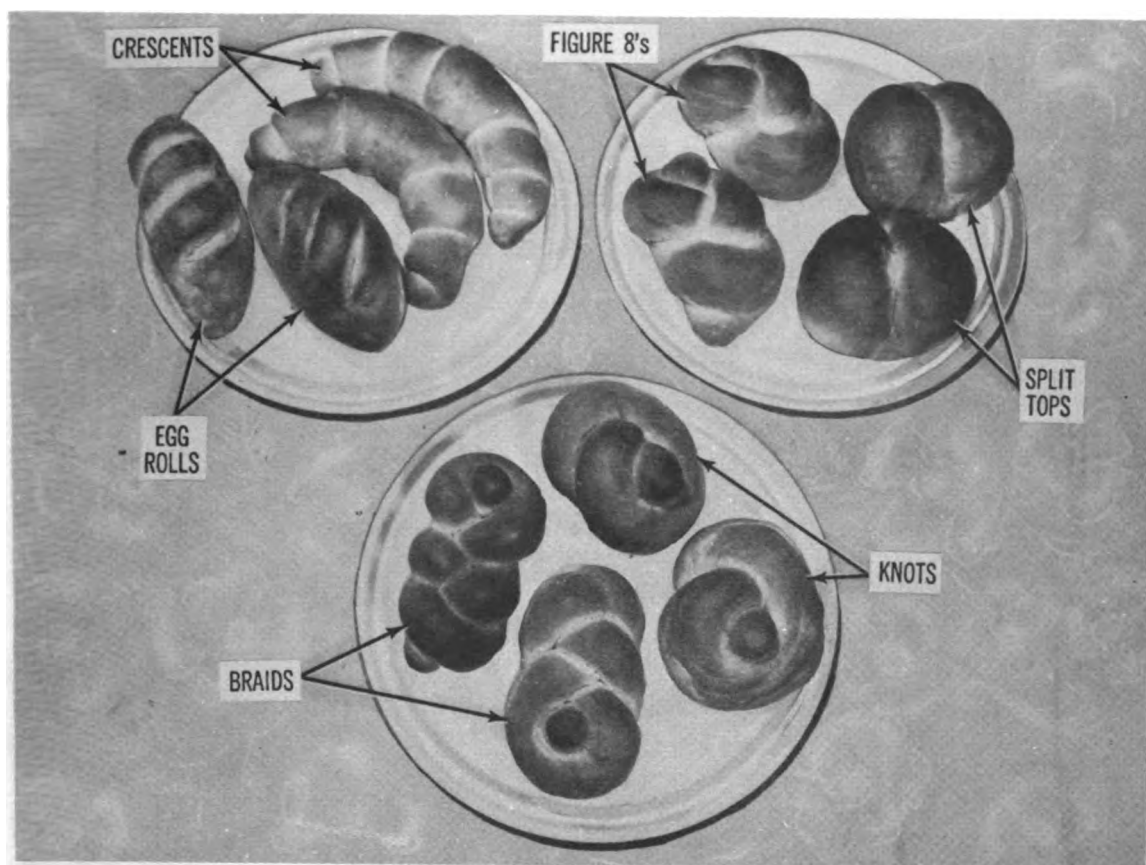


Figure 42. Soft rolls.

promoted or retarded by the amounts of salt and sugar used in the dough and by the temperature and consistency of the dough.

d. Salt. The primary function of salt is to enhance the flavor of the rolls. Another important function of salt is to regulate fermentation. Increasing the amount of salt in the formula will slow down the yeast activity or fermentation. Reducing the salt content will speed up fermentation. Salt also strengthens the gluten and gives it stability.

e. Sugar. Sugar performs many functions in a yeast dough. One of its functions is to supply the yeast with food. The gas produced by the action of yeast on sugar causes the dough to rise and conditions the gluten. The use of either too much or too little sugar will retard leavening. If too little sugar is used, there is an inadequate supply of sugar for conversion to carbon dioxide gas; if too much sugar (more than 10 percent of the weight of the flour) is used, fermentation will be retarded. Sugar also provides the necessary sweetness in the dough,

adds nutritional value, and gives a golden brown color to the crust. Soft rolls require a higher percentage of sugar than hard rolls. Sweet rolls and danish pastry have a higher percentage of sugar than soft rolls.

f. Shortening. Shortening is classified as an enriching ingredient. Shortening lubricates gluten and prevents its excessive development. Shortening also makes the dough more pliable. By lubricating the gluten, shortening helps the dough to expand more easily and smoothly. Soft rolls have a higher percentage of shortening than hard rolls, and sweet rolls and danish pastries have higher percentages of shortening than soft rolls. The moisture-retaining properties of shortening extend the keeping qualities of the product. The nutritional value of the product is improved by the addition of shortening.

g. Milk. Milk adds nutritional value to the product. Rolls made with milk have a better flavor than rolls made without it. Milk sugar (lactose) is not fermented by yeast but remains

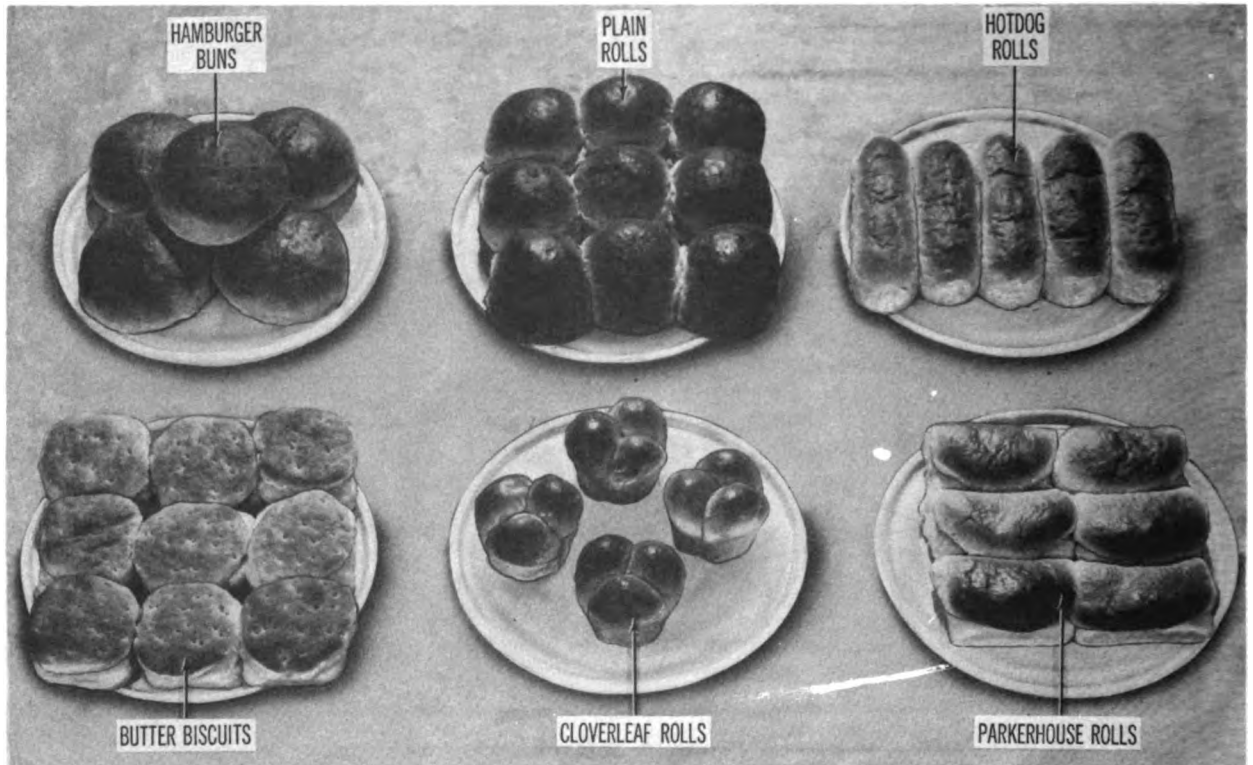


Figure 43. Hard rolls.

unchanged and caramelizes readily in the oven. This caramelization contributes to the formation of proper crust color.

h. Eggs. Eggs are important ingredients in yeast-leavened sweet rolls. The egg proteins assist the flour proteins in the formation of the structure. They help to support the weight of the sugar and shortening and thus keep the product from becoming heavy. For sweet doughs, it is advisable to keep the weight of

the eggs and the weight of the shortening about equal.

i. Flavoring Agents. Spices, such as mace and nutmeg, are often used for flavoring sweet doughs. Extracts of orange, lemon, or vanilla may be used singly or in combination. Grated lemon or orange peel may also be used. Care must be taken to avoid using too much flavoring.

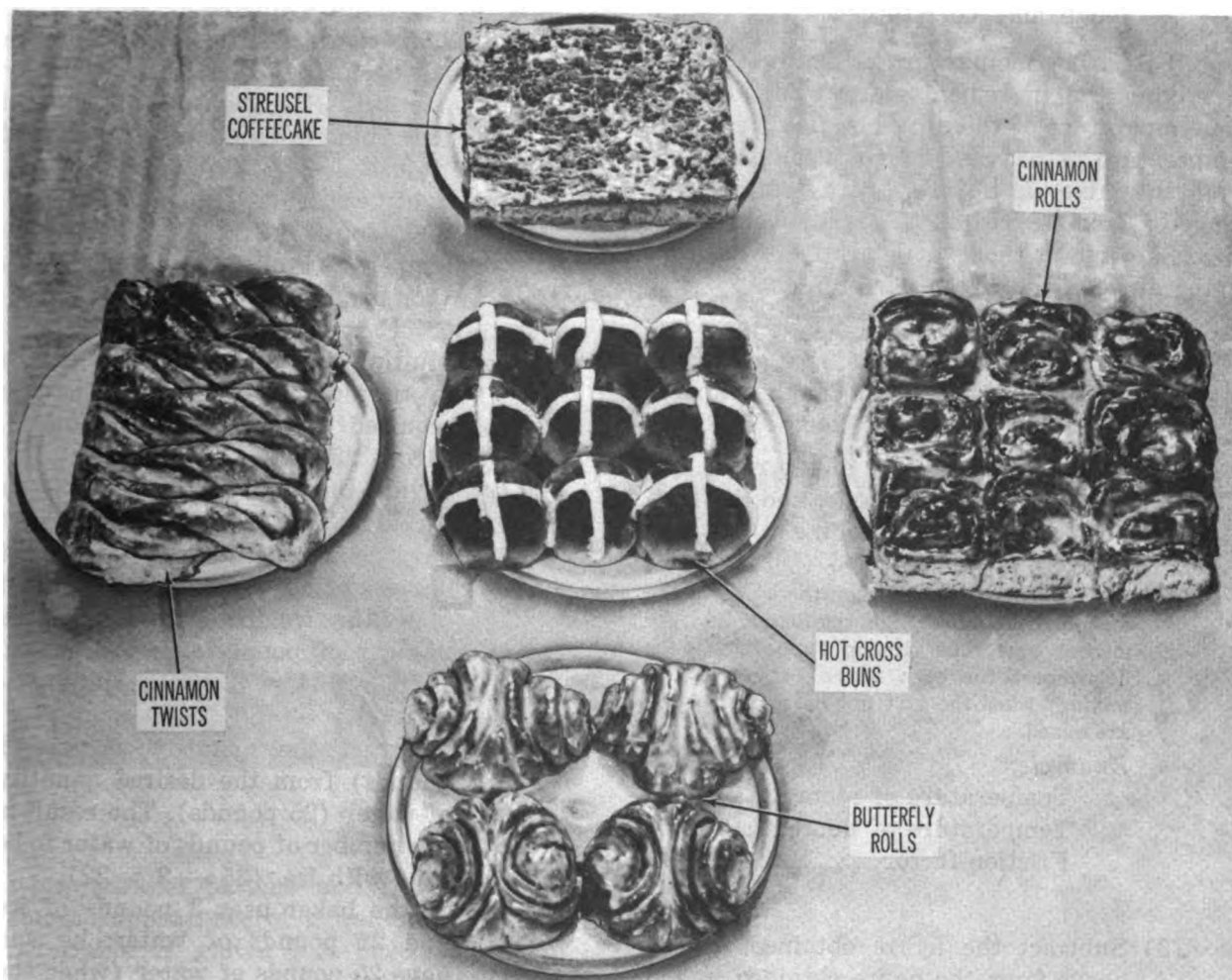


Figure 44. Sweet rolls.

Section II. PREPARATION

107. Preliminary Preparation of Ingredients

a. Yeast. Active dry yeast is the type of yeast procured by the Armed Forces, but compressed yeast may also be used with good results.

- (1) *Active dry yeast.* Because active dry yeast is more concentrated than compressed yeast, only half as much is required. Reconstitute active dry yeast by stirring in water. The temperature of the water should be between 105° and 110° F. Allow the suspension to stand for about 5 minutes and then stir before adding it to the mix.

- (2) *Compressed yeast.* Compressed yeast should not be allowed to become warm and therefore should not be taken from the refrigerator to the mixing room until just before it is to be used. The wrapper should not be removed until the yeast is ready to be used. To prepare compressed yeast for mixing in a dough, crumble the yeast in a container and add the required amount of water. After about 5 minutes, mix the yeast and water thoroughly with a wire whip. If yeast is added to the mix on top of sugar, salt, or other concentrated ingredi-

ents, the action of the yeast in the dough may be retarded.

b. *Water.* The temperature of the water used in mixing the ingredients largely determines the temperature of the mixed dough. The ideal temperature of a yeast dough when it comes from the mixer is 80° F., but a temperature range of from 78° to 82° F. is allowable. Use the following method to determine what the temperature of the water should be.

- (1) Multiply the desired dough temperature (80° F.) by 3 (there are three factors that determine dough temperature) ($80^{\circ} \text{ F.} \times 3 = 240^{\circ} \text{ F.}$).
- (2) Add the temperature of the room, the temperature of the flour, and the friction factor of the machine.

Note. The friction factor will vary from 10° to 30° F., depending on the speed of the machine, the stiffness of the dough, and the mixing time. The friction factor should be determined for each mixer (or for hand-mixing) when the first few batches of dough are mixed.

Example:

Temperature of room	----75° F.
Temperature of flour	----73° F.
Friction factor	-----30° F.
	178° F.

- (3) Subtract the figure obtained in (2) above from the figure obtained in (1) above ($240^{\circ} \text{ F.} - 178^{\circ} \text{ F.} = 62^{\circ} \text{ F.}$). The result, 62° F. in this example, is the temperature of the water to be used in mixing the dough.
- (4) That part of the water used to suspend compressed yeast must not exceed a temperature of 90° F. The water used to suspend active dry yeast must not exceed a temperature of 90° F. The water used to suspend active dry yeast must not exceed 110° F. If the result obtained in (3) above indicates that the temperature of the water must be over 90° or 110° F. (depending on which type of yeast is being used), the temperature of the remaining water called for in the recipe must be raised accordingly.
- (5) If the result obtained in (3) above indicates that the desired temperature

of the water is below the temperature of the water available, either mechanical refrigeration equipment or ice must be used to reduce the water temperature. Use the following method to determine the amount of water and ice to use.

- (a) Subtract the desired water temperature (for example, 62° F.) from the temperature of the water available (for example, 80° F.). ($80^{\circ} \text{ F.} - 62^{\circ} \text{ F.} = 18^{\circ} \text{ F.}$)
- (b) Multiply the figure obtained in (a) by the number of pounds of water required (for example, 25 pounds). ($18 \times 25 = 450$.)
- (c) Divide the figure obtained in (b) by 144. The figure 144 does not vary; it represents the number of degrees of heat removed by 1 pound of melting ice. The result equals the number of pounds of ice required. ($450 \div 144 = 3$ pounds (approximately).)
- (d) Subtract the quantity of ice (3 pounds) from the desired quantity of water (25 pounds). The result is the number of pounds of water to be used with ice. ($25 - 3 = 22$.)
- (e) If the baker uses 3 pounds of ice and 22 pounds of water, he will have 25 pounds of water (when the ice has melted) at the desired temperature of 62° F.

108. Mixing

After the ingredients have been prepared and accurately scaled, the baker is ready to start mixing the dough. Thorough mixing is necessary to distribute the yeast cells throughout the dough, to distribute the food for the yeast, to remove lumps, and to form and develop the gluten. For the satisfactory development of gluten, all particles of flour must be thoroughly wet. Mixing brings moisture into contact with the gluten-forming proteins in the flour. As the mixing continues, all dough ingredients stick together; the gluten continues to be formed until a complete gluten network is developed in the dough. The mixing process of pulling and folding the dough mass is continued until the gluten particles form a some-

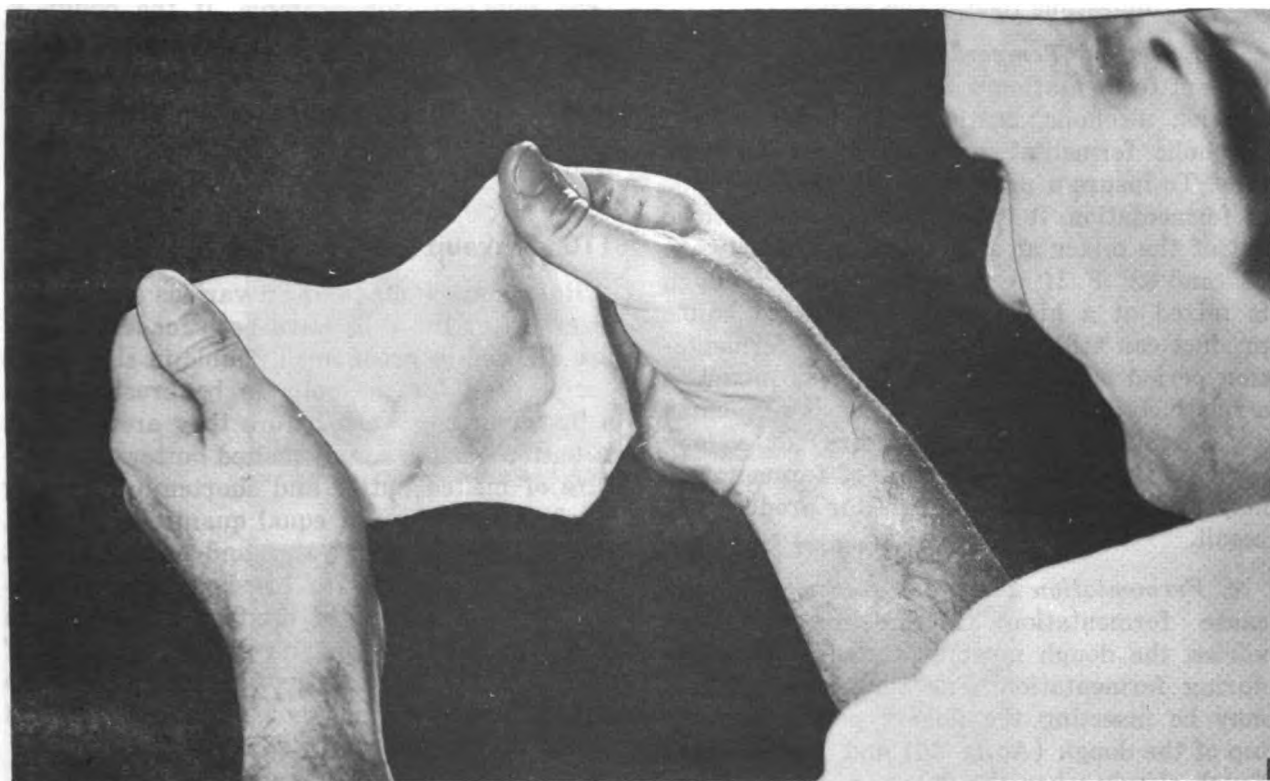


Figure 45. Checking gluten development in yeast dough.

what parallel pattern and thus produce the smooth appearance of a well-mixed dough. To determine if gluten has developed properly, stretch a piece of dough between the fingers (fig. 45); if the gluten has reached the proper point of development, the dough can be stretched almost as thin as a sheet of paper and it will be almost possible to see through it. Avoid overmixing the dough. If dough is over-mixed, it will become very sticky and will lack elastic properties; and an inferior product will result. Good hard roll dough should be of a medium stiff consistency. Properly mixed soft roll dough should be of a fairly soft consistency and will leave the bowl clean when the dough is picked up. Sweet roll dough should be of a fairly soft consistency and slightly sticky. After the dough is properly mixed, place it in a lightly greased bowl, smooth the dough by folding, and cover with a clean damp cloth.

Note. The bowl should be approximately three times the size of the dough to allow room for expansion.

If the bowl is greased too heavily, streaks may develop in the rolls when they are baked.

109. Fermentation

Fermentation starts immediately after the yeast is put into the mixture, and the chemical changes continue until the yeast is killed by the heat in the oven. As the term is generally used, however, the fermentation period is the time between mixing and dividing the dough for makeup. Punching the dough is included in this period.

a. Purposes of Fermentation.

- (1) The primary purpose of fermentation is to leaven the dough. Leavening is the result of chemical action that creates carbon dioxide gas which, when caught in the gluten network, expands and causes the whole dough mass to expand.
- (2) The secondary purpose of fermentation is to mature, or ripen, the dough. Ripening is the result of changes in the gluten which cause the gluten to stretch more effectively. The dough be-

comes more spongy; a light, easily digestible food is the result.

b. Effect of Temperature. There are four types of fermentation which take place in yeast doughs: alcoholic, acetic, lactic, and butyric. Alcoholic fermentation is the most desirable type. To insure a predominantly alcoholic type of fermentation, it is best to have dough come out of the mixer at a temperature of between 78° and 82° F. If during cold weather a dough is mixed at a higher temperature, an edible product can still be produced if the fermentation period is shortened. If dough is mixed at a relatively high temperature and is fermented at a relatively high temperature for a long period of time, the other types of fermentation may predominate; and an inferior product will result.

c. Fermentation Time Before Punching. Because fermentation time before punching varies, the dough must be tested at intervals during fermentation. The time for punching may be inserting the fingers gently into the top of the dough (A, fig. 46) and observing the dough closely when the fingers are withdrawn. When the proper fermentation stage for punching has been reached, the dough will neither collapse nor spring back, but will sink slightly around the depression (B). If the indentation caused by the fingers tends to spring back, the dough is not ready for punching. If the dough falls rapidly, the proper time for punching has already passed; and the dough should be punched and made up at once.

d. Fermentation Time for Hard Roll Dough. Because hard roll dough is a lean dough, it requires a longer fermentation time than soft roll dough. This longer fermentation time or conditioning of the dough is one of the main reasons for the distinctive flavor of hard rolls.

e. Punching the Dough. When the proper time for punching has arrived, press the dough down by hand and fold it from side to side until most of the carbon dioxide gas has been expelled (C, fig. 46).

f. Fermentation Time After Punching. After the dough has been punched, it usually is covered with a clean damp cloth and left to ferment for an additional 15 to 30 minutes before it is made up. There are times, however, when

it is best to make up the dough as soon as it has been punched—for example, if the dough is to be refrigerated before it is baked, if make-up time is to be lengthy, or if the dough has passed the proper state for punching. It is better to take dough on the young side rather than on the old side.

110. Makeup and Proofing

Rolls may be made up in various shapes and sizes. After the rolls have been made up, they are allowed to proof until double in size. Some recipes call for the rolls to be brushed with a butter or egg wash before they are proofed. A butter wash is simply melted butter or a mixture of melted butter and shortening. An egg wash is a mixture of equal quantities of eggs, evaporated milk, and water, and a small amount of salt. Hard rolls are brushed with a cornstarch wash (a cooked mixture of cornstarch and water) after they have been proofed. If rolls are overproofed, they are likely to be too dry; if underproofed, they may be tough and heavy or irregularly shaped.

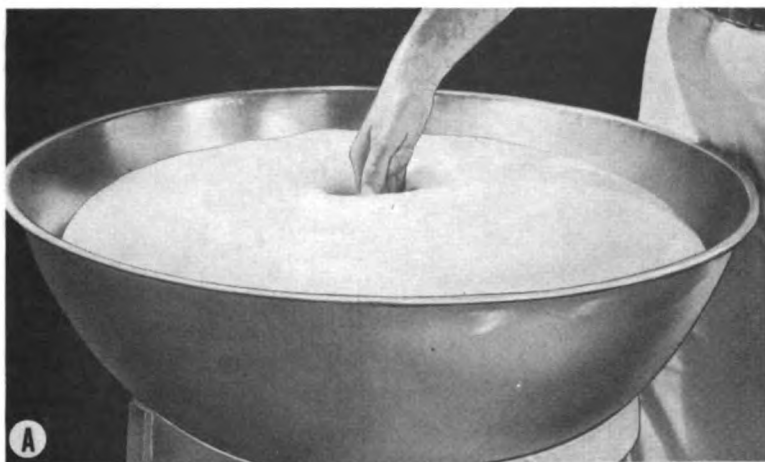
a. Hard Rolls. Plain hard rolls may be made up by hand (fig. 47) or with a roll divider (fig. 48). If a roll divider or a roll divider and rounder (par. 21) is used, scale the dough into pieces equal to 36 times the weight of the dough allowed for each roll. Directions for making up other types of hard rolls are contained in TM 10-412-5.

b. Soft Rolls. The procedures shown in figures 47, 48, and 49 may also be used for making up plain soft rolls. Figures 50 through 54 illustrate methods of making up various types of rolls from soft roll dough. Other methods are contained in TM 10-412-5.

c. Sweet Rolls. Figure 55 shows the method of making up sweet roll dough. Figures 56 through 59 illustrate methods of making up various types of rolls from sweet roll dough. Other methods are contained in TM 10-412-5 and AFM 146-12.

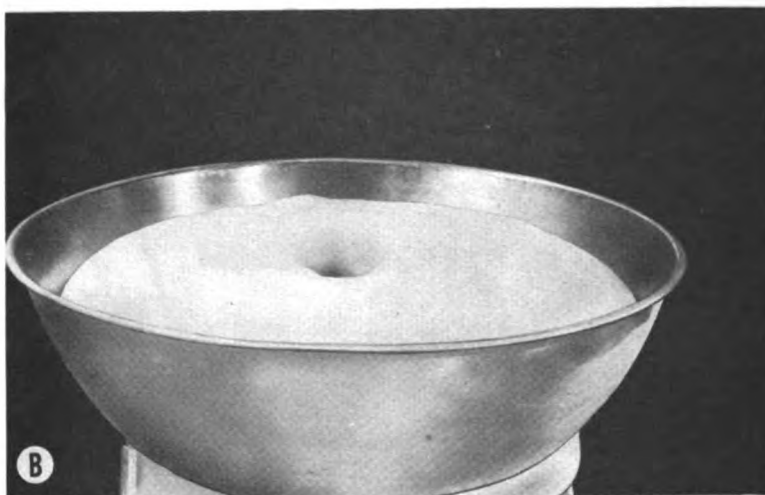
111. Baking and Finishing

Bake rolls at the oven temperature and for the length of time specified in the recipe. If rolls are overbaked, they will be tough or the



A

Insert fingers gently into top of dough; then withdraw fingers.



B

Dough is ready for punching if indentation made by fingers remains and dough recedes slightly.



C

Punch dough by pressing it down by hand and folding it from side to side.

Figure 46. Testing for punch and punching dough.

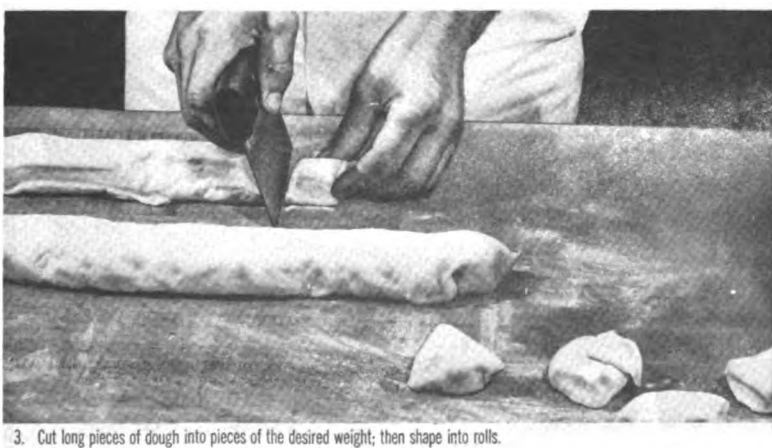
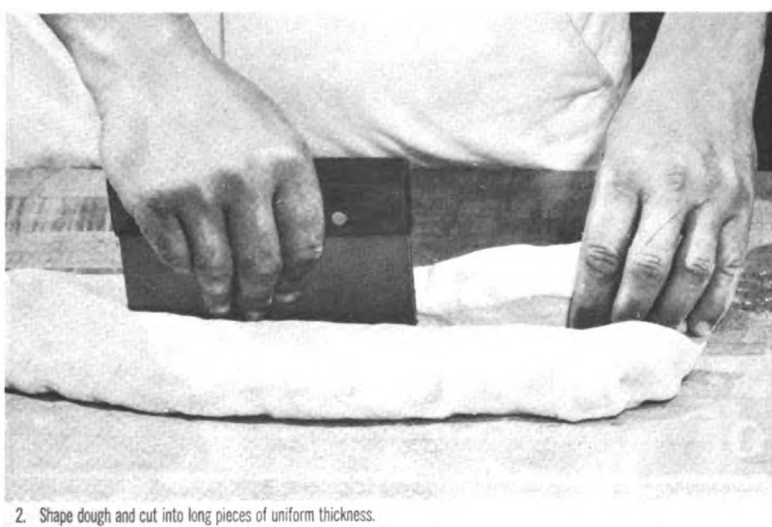
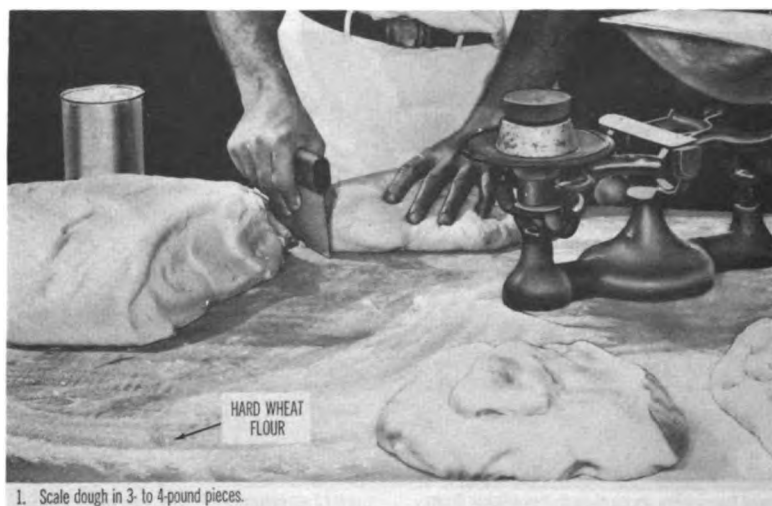
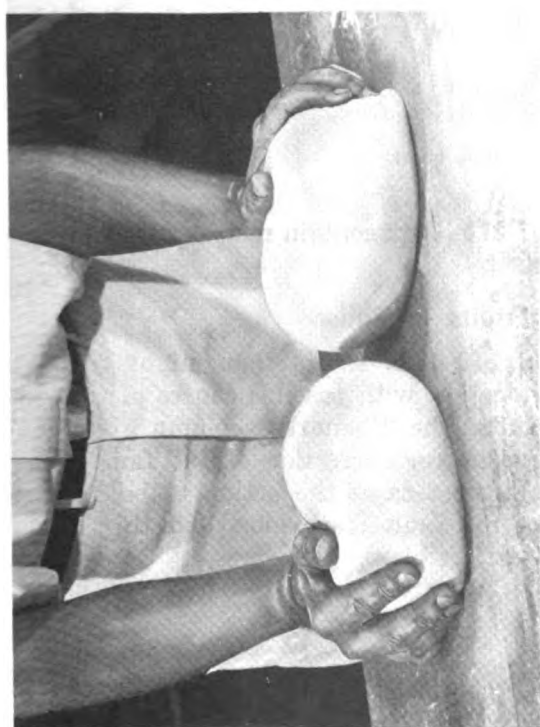


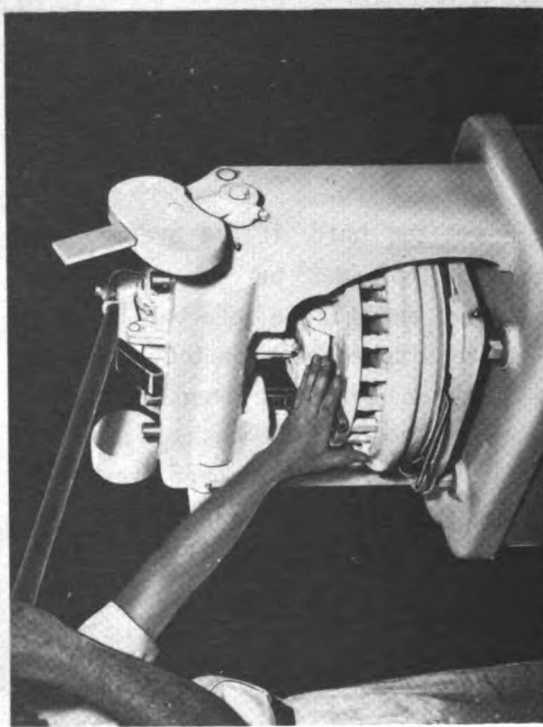
Figure 47. Making up rolls by hand.



1. Round up scaled dough and allow to rest.



2. Flatten dough on dough press pan.



3. Position pan in roll divider and pull down on handle.



4. If machine does not round rolls automatically, round them by hand as shown in figure 49.

Figure 48. Making up rolls using roll divider.

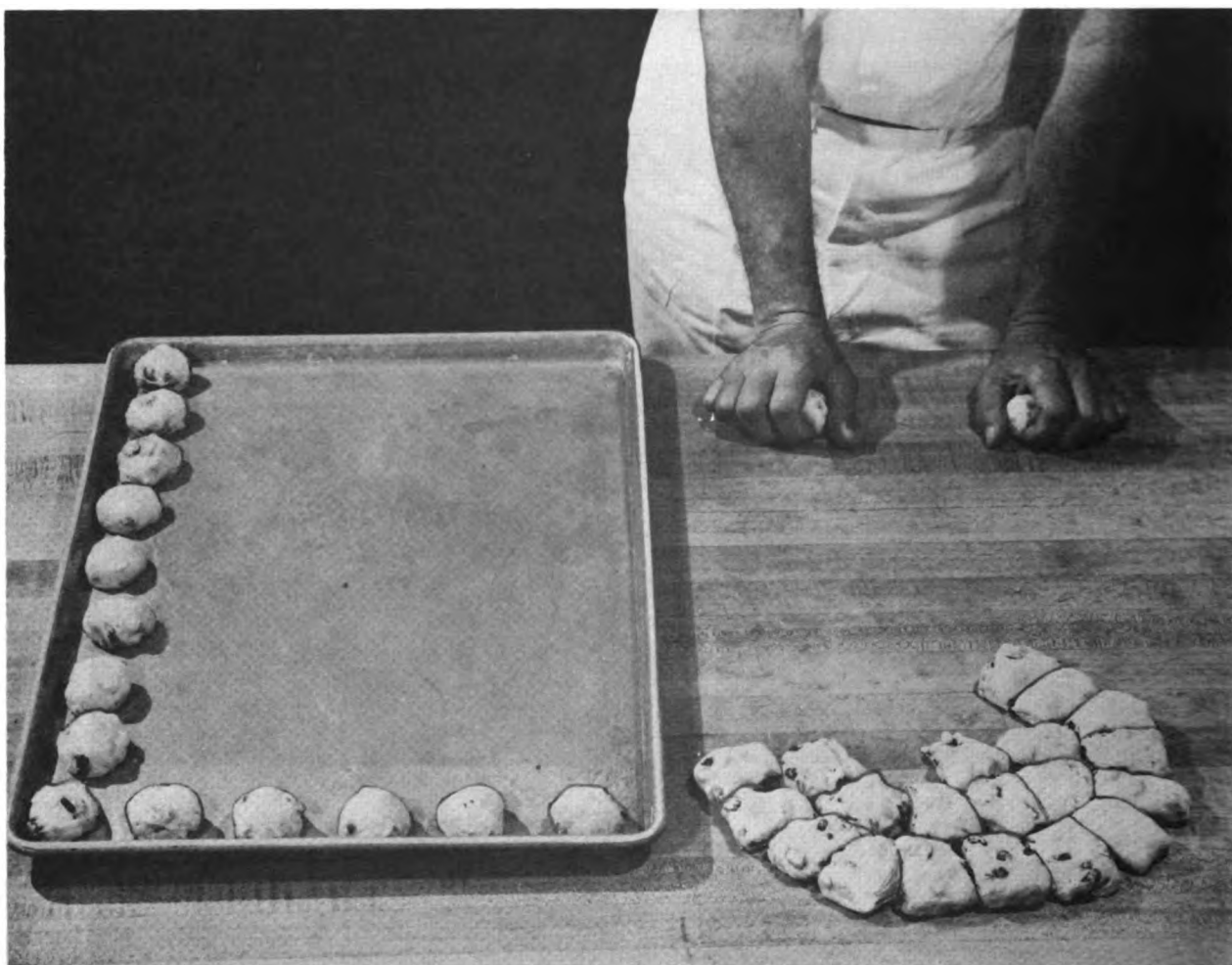


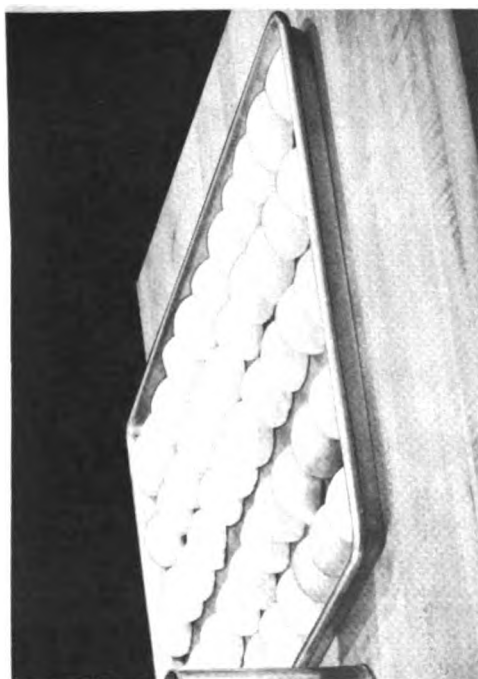
Figure 49. Rounding divided dough by hand.

crust will get too hard. If the oven is too hot, the rolls will get too brown; if the oven is not hot enough, the rolls will be pale. Soft rolls are brushed with melted butter as soon as they come from the oven; hard rolls are brushed with cornstarch wash. A glaze or icing may be brushed or spread over sweet rolls after removal from the oven. Figure 60 shows two methods of icing sweet rolls. TM 10-412-5

and AFM 146-12 contain recipes for glazes and icings.

112. Faults in Rolls

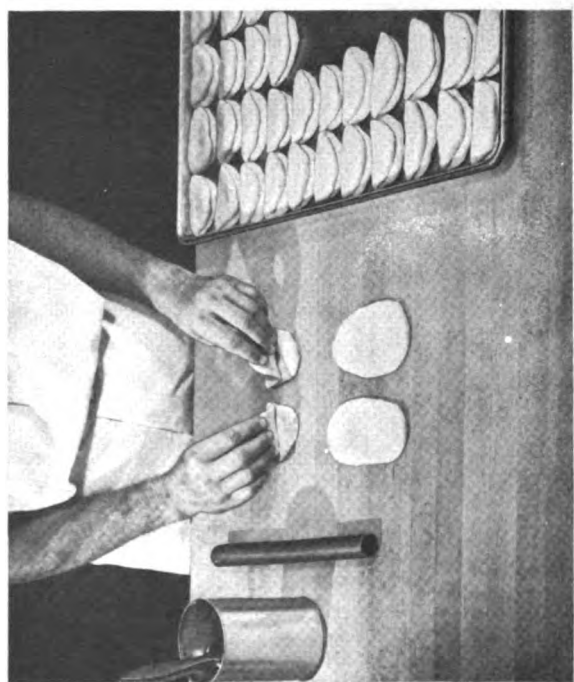
Table 10 lists faults that might occur in rolls, together with possible causes of the various faults. The "Remarks" column gives some suggestions for correction of the faults; however, in most cases the action to be taken to correct the fault is obvious, and this column has been left blank.



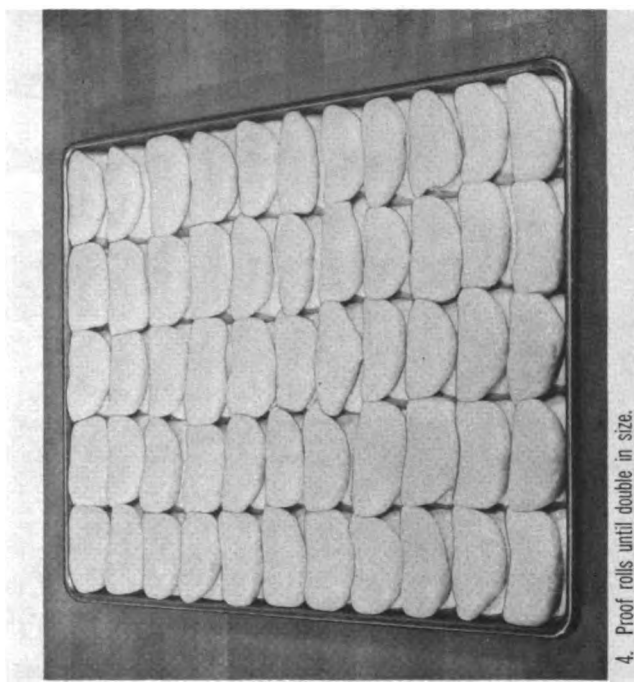
1. Follow procedures in figure 47; let rounded rolls rest 5 to 10 minutes.



2. Brush rounded rolls with melted butter; then press center of each roll with a small rolling pin, forming a piece about 3 inches long.



3. Fold rolls, greased sides together, and press down to hold shape.



4. Proof rolls until double in size.

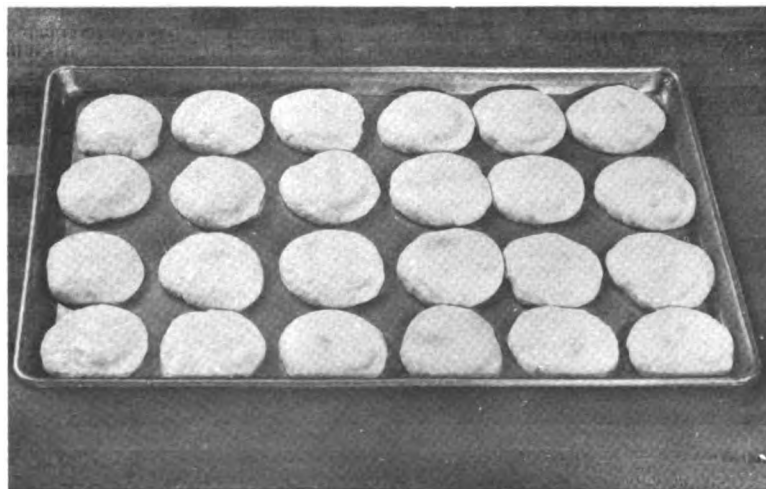
Figure 50. Preparing parkerhouse rolls.



1. Shape 2-ounce pieces of dough into balls and place on greased sheet pans.

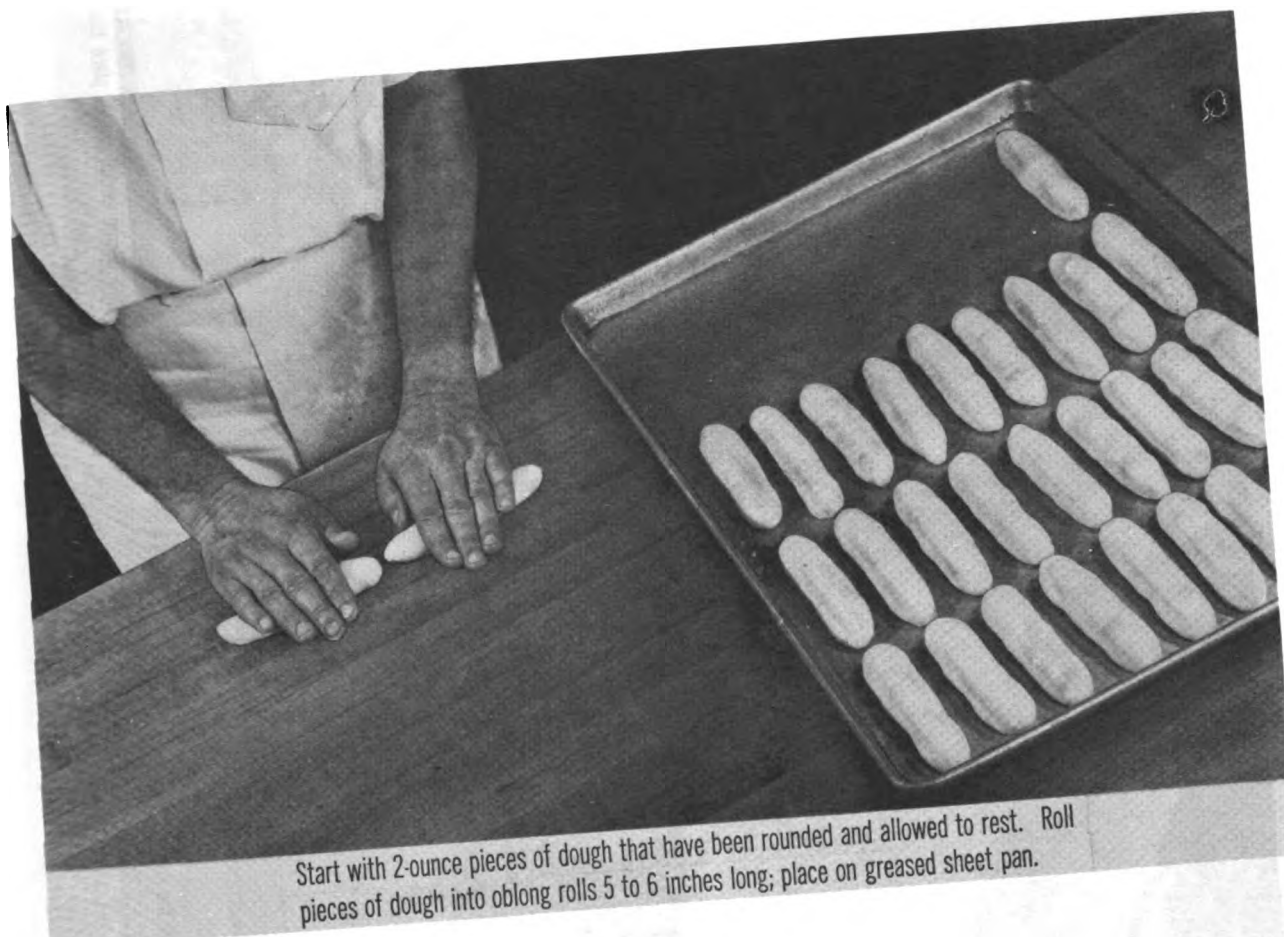


2. When buns are half proofed, flatten to 1/4- to 1/2-inch thickness.



3. Continue proofing until buns are double in size.

Figure 51. Preparing hamburger buns.

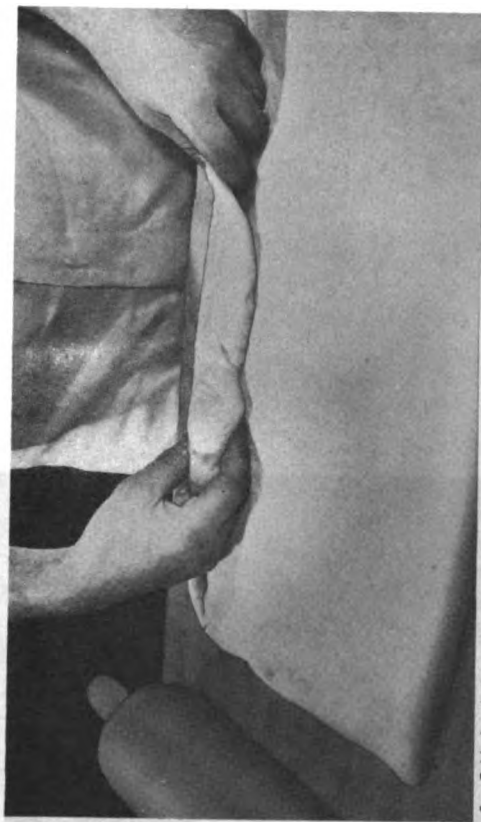


Start with 2-ounce pieces of dough that have been rounded and allowed to rest. Roll pieces of dough into oblong rolls 5 to 6 inches long; place on greased sheet pan.

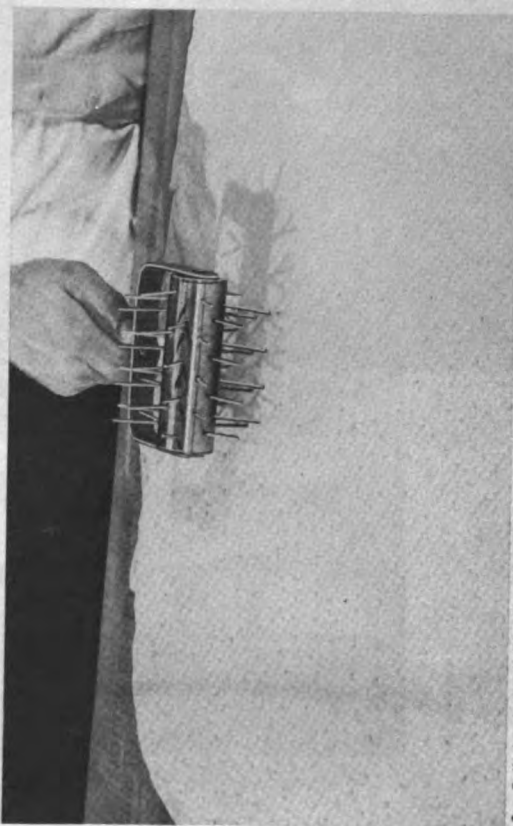
Figure 52. Shaping hotdog rolls.



1. Roll dough into a rectangular shape, about $\frac{1}{3}$ inch thick; then brush with melted butter.



2. Fold dough to make two layers.

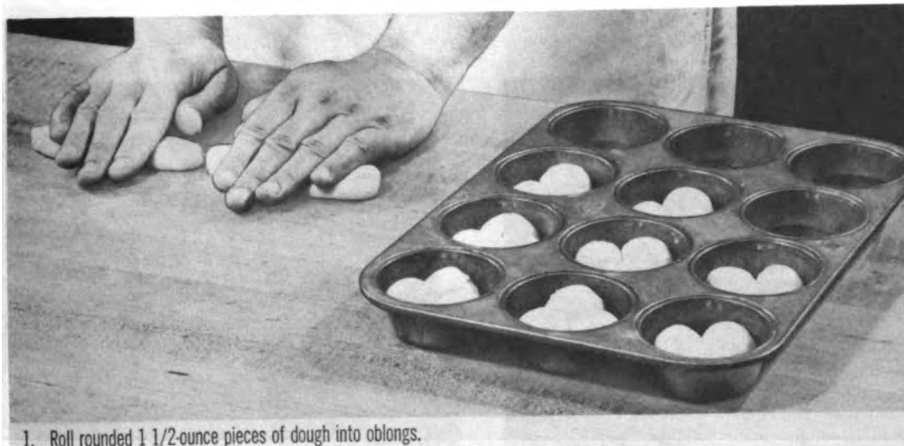


3. Roll dough to $\frac{1}{2}$ -inch thickness; then dock the dough.

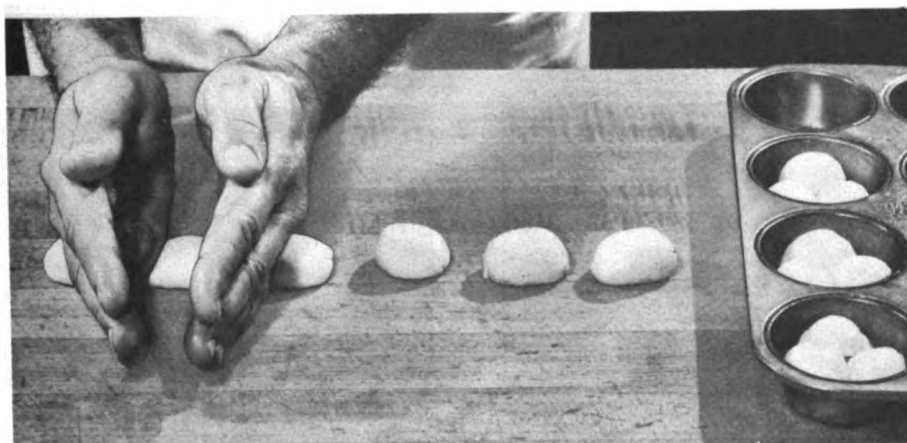


4. Cut dough with floured biscuit cutter; place biscuits on greased sheet pan; then brush with melted butter or egg wash.

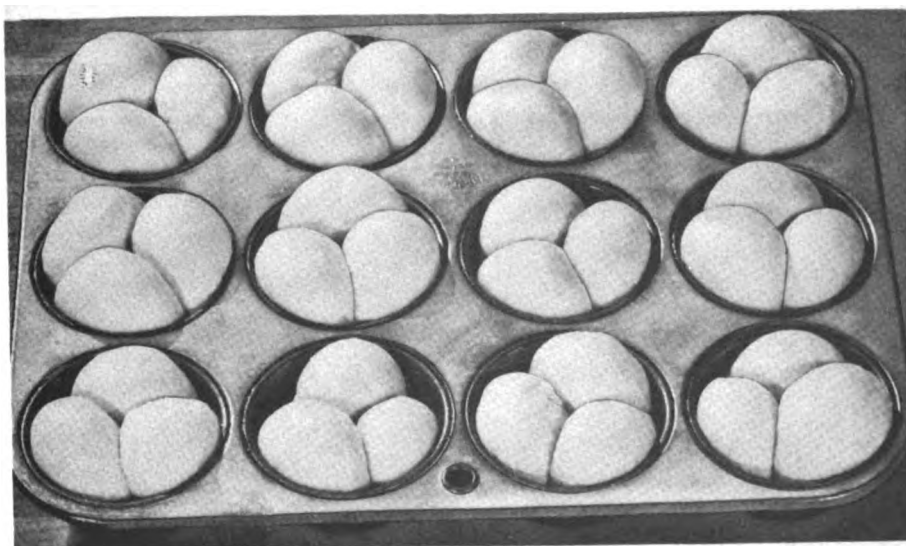
Figure 53. Preparing butter biscuits.



1. Roll rounded 1 1/2-ounce pieces of dough into oblongs.



2. Cut each oblong piece into thirds; place in greased muffin tins.



3. Allow rolls to proof until double in size.

Figure 54. Preparing cloverleaf rolls.



1. Scale dough (divide into four pieces of equal size).



2. Stretch dough.



3. Bring ends together and overlap slightly.



4. Flatten folded dough.

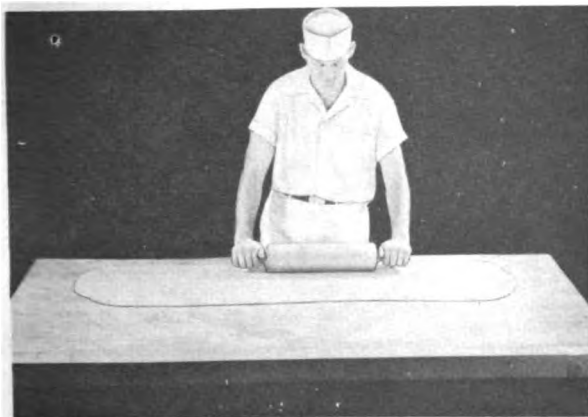


5. Fold dough from front to back.

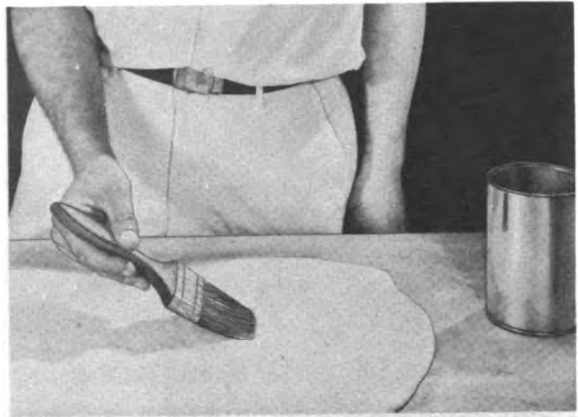


6. Seal dough in rectangular shape.

Figure 55. Preliminary steps in makeup of sweet roll dough.



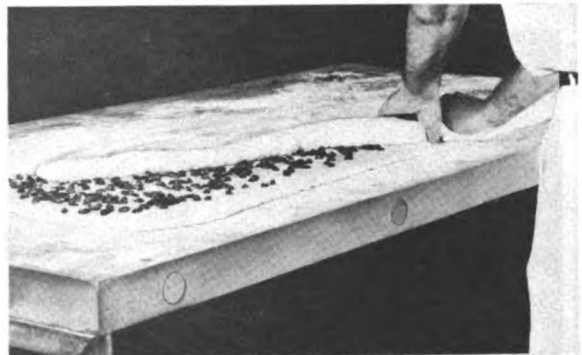
1. Roll dough into a rectangular sheet, about 1/4 inch thick.



2. Brush with melted butter.



3. Sprinkle with raisins, then with cinnamon and sugar.



4. Roll dough to make a long, slender roll.

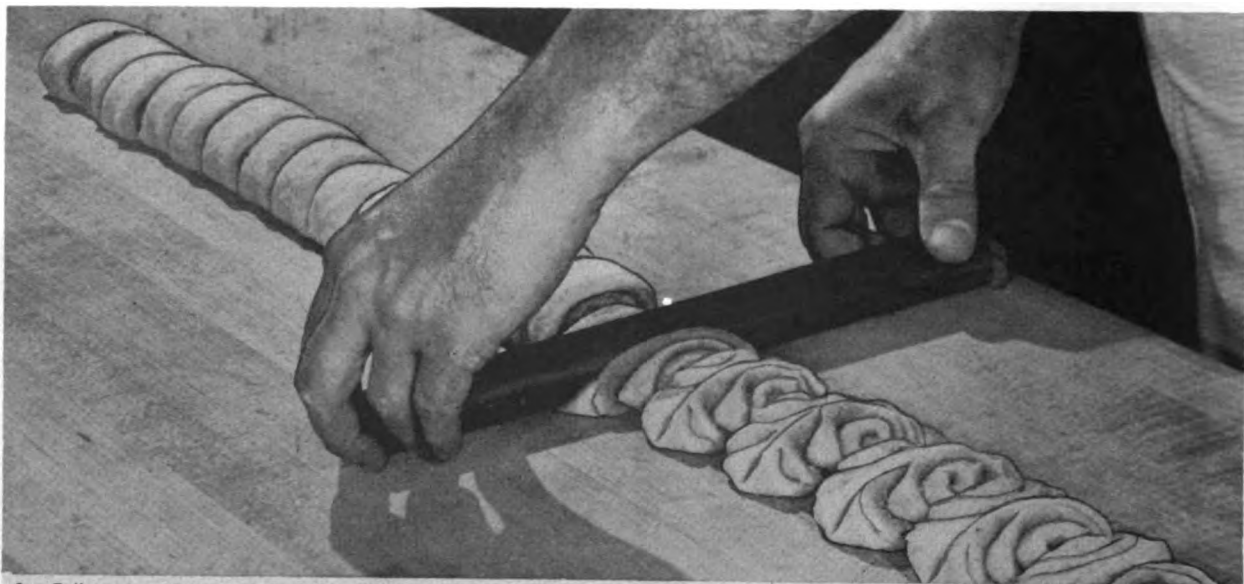


5. Cut roll into 54 uniform pieces. Rolls may be cut by hand or with squirrel cage cutter.



6. Place cut side down on greased baking sheet; proof rolls until double in size.

Figure 56. Preparing cinnamon rolls.

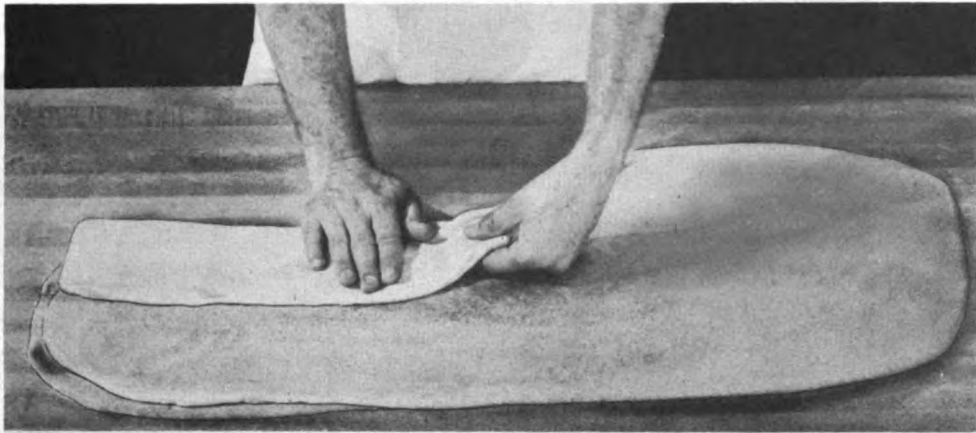


1. Follow steps 1 through 4 of figure 56 (raisins are optional). Cut roll in pieces about 1 1/2 inches wide; then firmly press each piece, parallel with cut, using a small rolling pin or back of a knife.



2. Place rolls on greased baking sheet and proof until double in size.

Figure 57. Preparing butterfly rolls.



1. Follow steps 1 through 3 of figure 56, but omit the raisins; make first fold.

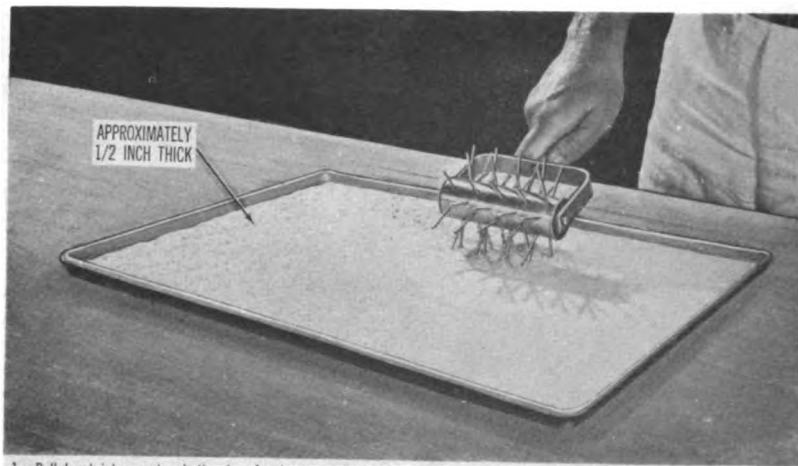


2. Make second fold.

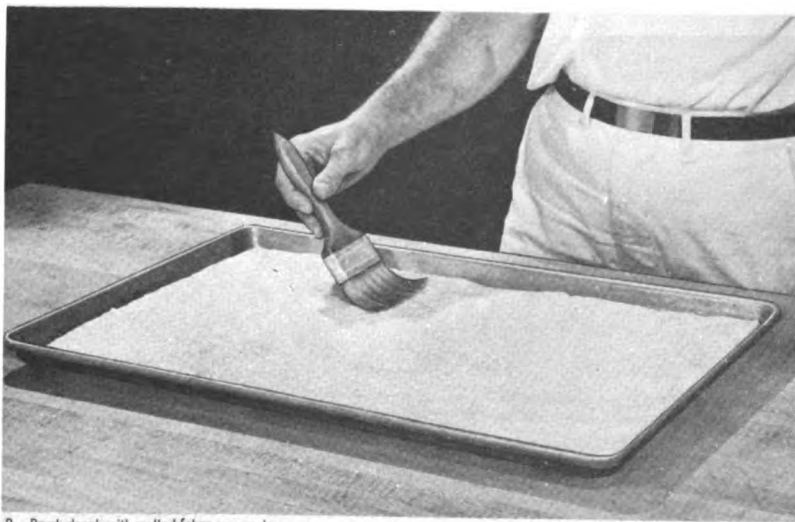


3. Cut folded dough into 1-inch strips and twist each strip several times.

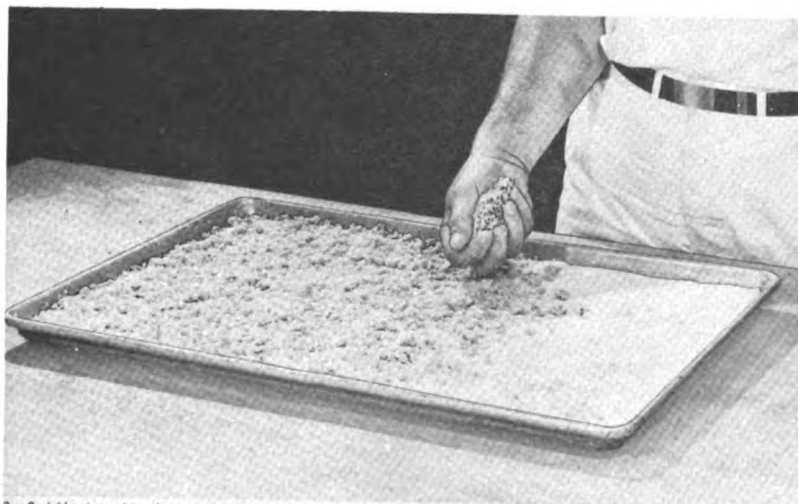
Figure 58. Preparing cinnamon twists.



1. Roll dough into a rectangle the size of a sheet pan; place dough in pan and dock.



2. Brush dough with melted fat or egg wash.

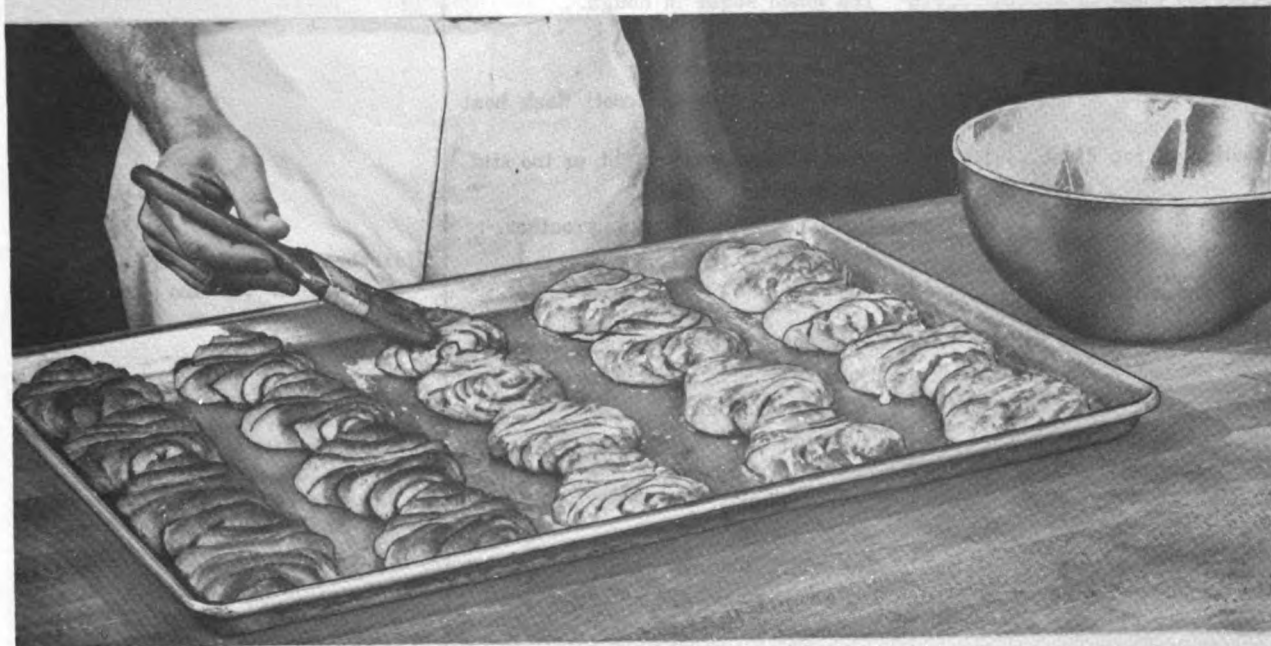


3. Sprinkle streusel topping over dough.

Figure 59. Preparing streusel coffeecake.



Icing hot cross buns with pastry cone.



Brushing icing on butterfly rolls.

Figure 60. Two methods of icing sweet rolls.

Table 10. Faults in Rolls; Causes and Corrections

Faults	Causes	Remarks
Lack of volume -----	Too much salt. Dough too old, too young, or too stiff. Dough underproofed. Initial oven temperature too high.	Salt may slow or halt yeast activity. Proof until approximately double in size. Oven should be heated to proper temperature before rolls are put in for baking.
Too much volume -----	Rolls knocked down after proofing. Not enough salt to control yeast action. Dough overproofed. Oven too cool.	
Pale crust color -----	Not enough sugar, salt, or milk in dough. Dough hot and overfermented. Dough old. Dough underproofed. Oven too cool.	
Dark crust color -----	Too much salt, sugar, milk, or malt. Dough too young. Dough overproofed. Flash heat in oven.	
Crust blisters -----	Dough too slack. Dough too young.	Follow formula carefully.
Crust too thick -----	Too much humidity in proofbox. Too much sugar in dough. Dough old. Dough overproofed. Oven too hot or too cool; flash heat in oven.	
Shelling of top crust -----	Dough too young, too old, or too stiff. Dough underproofed. Not enough humidity in proofbox. Flash heat in oven.	Flash heat will frequently cause rolls to bake on top too quickly and loosen the crust.
Crust too tough and brittle -----	Not enough shortening, salt, or sugar. Dough old. Dough overproofed. Oven too hot, or flash heat in oven.	
Crust rubbery -----	Too much milk or salt, or too little shortening. Dough young.	
Grain open or irregular -----	Too much steam in oven. Dough underproofed or overproofed. Not enough fermentation. Oven too cool.	
Poor texture -----	Too much salt; hard water used. Lack of sugar, shortening, or milk. Dough too stiff, too hot, too young, or too old.	

Table 10. *Faults in Rolls; Causes and Corrections*—Continued

Faults	Causes	Remarks
Acid taste -----	Dough underproofed or overproofed.	Occasionally, the product will form a crust during intermediate proofing; this causes poor texture.
Flat taste -----	To much dusting flour used.	
	Not enough salt in dough.	
	Dough too old or too hot.	
	Not enough salt or sugar.	
	Off-flavored ingredients or alkaline water used.	
	Dough underfermented.	
	Rolls underbaked or overbaked.	

CHAPTER 10

DANISH PASTRY

113. General

Various types of danish pastry (figs. 61 and 62) are made from a yeast-raised sweet dough that has quantities of fat incorporated in layers to produce flakiness in the baked items. The fat, either butter or shortening is rolled into the dough (fig. 63). The amount of fat used is equal to about one-fourth the weight of the dough. The dough and roll-in material should be of the same consistency so that the roll-in material will not be forced through the dough

during the rolling or folding process. When short flat pieces of baked goods are desired, the dough is mixed as little as possible. When ovenspring is desired, the dough is mixed more thoroughly to give greater volume and a larger flake.

114. Resting Dough

The dough is rolled and folded three more times after the first (4 and 5, fig. 63) and is refrigerated between rolls. The time intervals

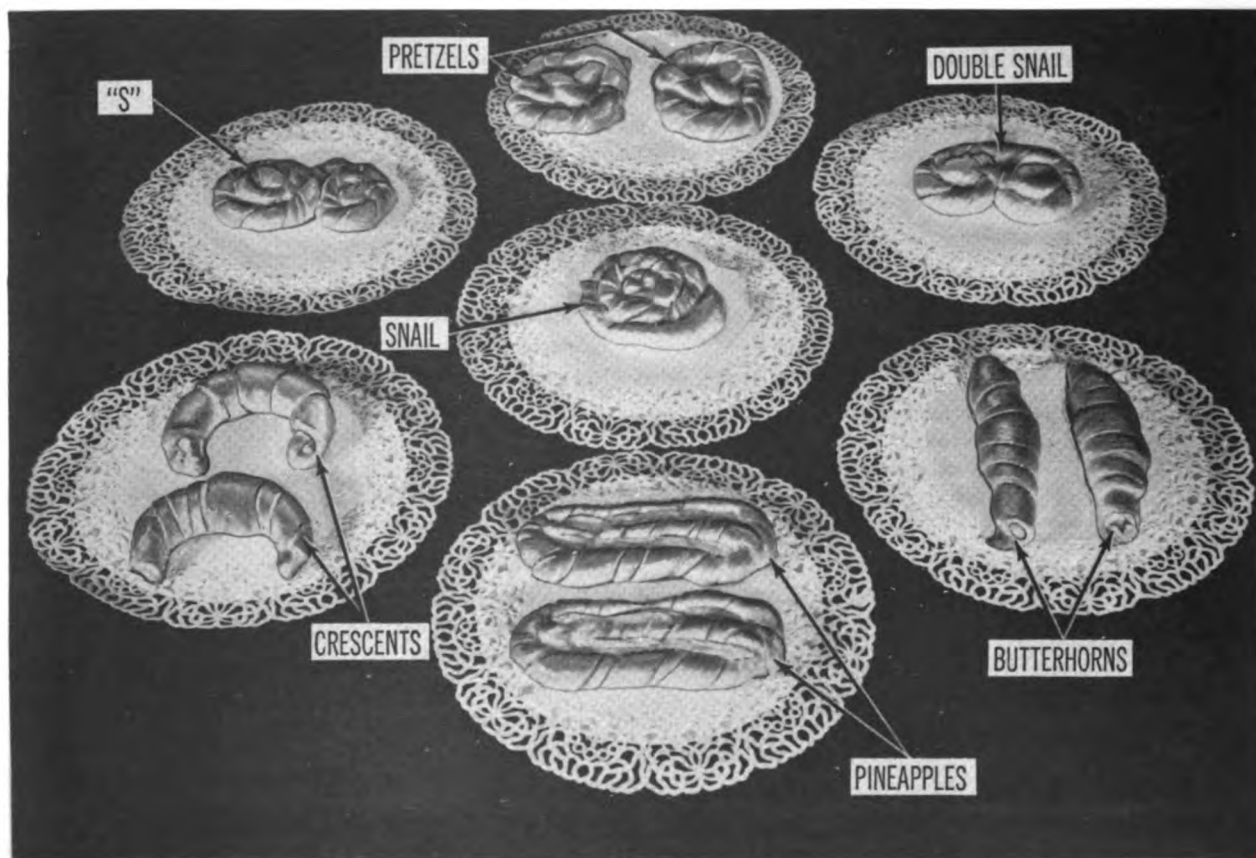


Figure 61. Danish pastries.

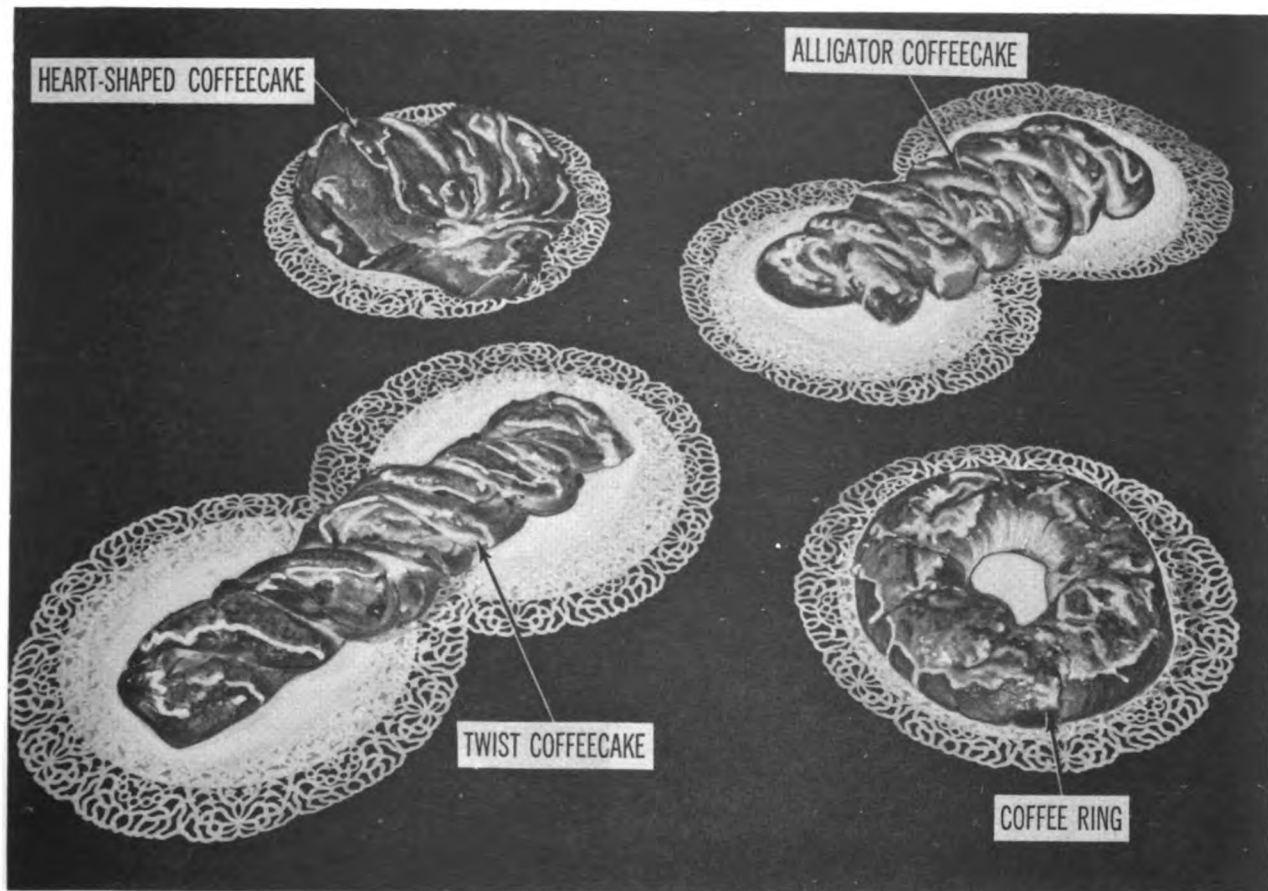


Figure 62. Danish coffeecakes.

between rolls is determined by the ability of the dough to loosen enough to be pliable when rolled. If the dough is not relaxed enough, greater rolling pressure will be required, which may cause the layer structure to break down. If the dough is allowed to rise too much, the fat pieces may pierce the dough and destroy the layer formation. The time interval cannot be definitely established because it is determined by variable factors such as the amount of yeast used, the dough temperature, the stiffness of the dough, and the plasticity of the roll-in material.

115. Makeup

Figure 64 illustrates the preliminary steps in danish pastry makeup, and figures 65 through 67 show methods of making up individual danish pastries after the steps shown in figure 64 have been accomplished. Figure

68 shows a method of making butterhorns from danish pastry dough. Butterhorns may also be made from hard, sweet, or soft roll dough. Figures 69 through 72 show methods of making up coffeecake from danish pastry dough.

116. Proofing, Baking, and Finishing

TM 10-412-5 and AFM 146-12 contain a number of recipes for fillings, glazes, and icings for danish pastry. Some of the fillings are spread over the dough during makeup (fig. 69); some are added after the dough has been proofed (fig. 66). Glazes and icings are spread over the pastry immediately after baking. If the dough is too young, the pastry will flake during baking; if the dough is too old, the pastries will break up. Keep proofbox temperature lower than the melting point of the roll-in material. If the temperature is too high, the roll-in material will melt and leak out of the



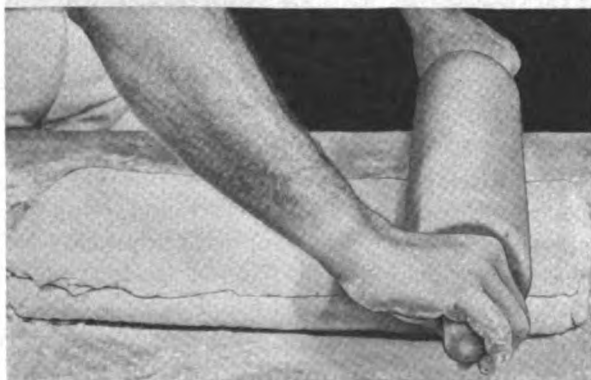
1. Roll dough to about 1/2-inch thickness; then spot fat on two-thirds of surface.



2. Fold the third without fat over the center third.



3. Fold the remaining third over the other two thirds.



4. Roll folded dough to 1/2-inch thickness.

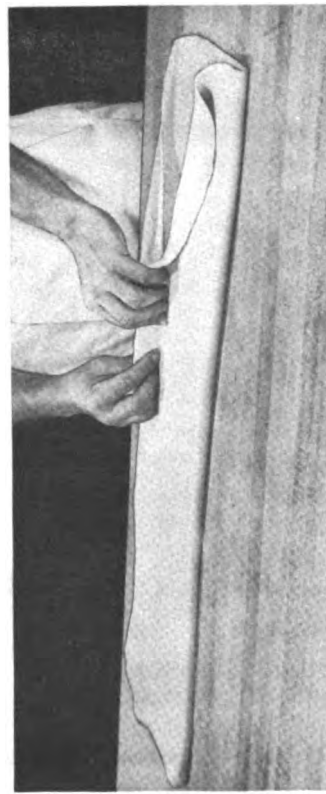


5. Repeat folding procedures in 2 and 3, omitting fat; then refrigerate dough.

Figure 63. Rolling fat into danish pastry dough.



1. Roll dough into a rectangular sheet 1/4 inch thick; brush with melted butter.



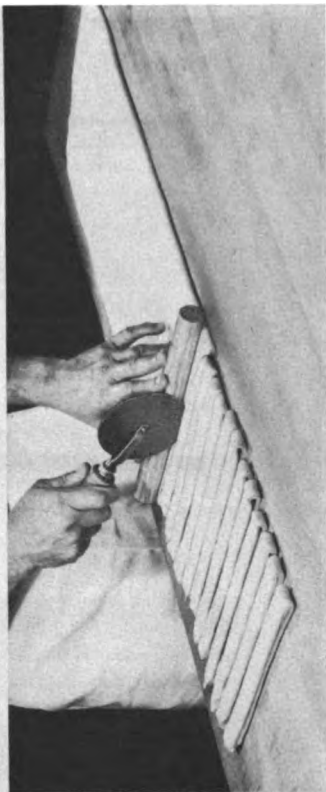
3. Fold dough lengthwise into thirds.



5. Twist each strip of dough.



2. Sprinkle cinnamon and sugar mixture over dough.

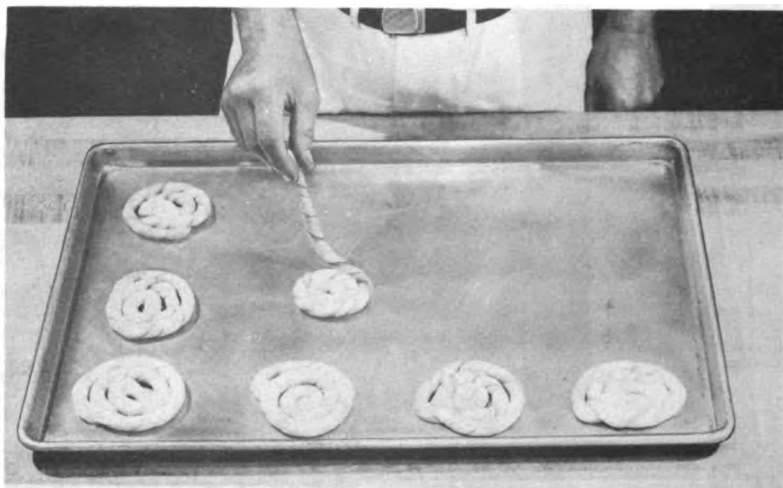


4. Cut dough crosswise into 1-inch strips.

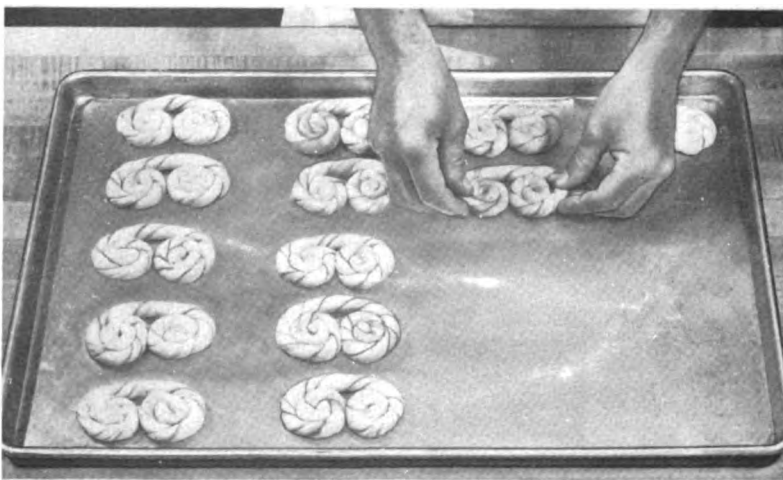


6. Roll twisted dough until piece is 10 to 12 inches long.

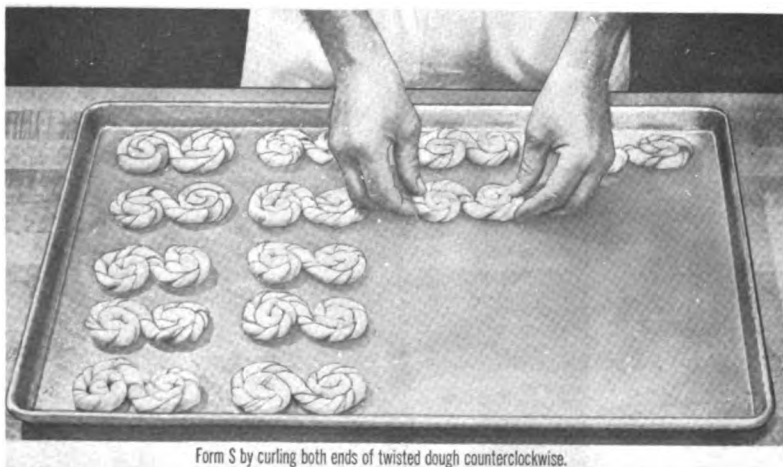
Figure 64. Preliminary steps in danish pastry makeup.



Form snail by winding twisted dough in circle; tuck loose end under.

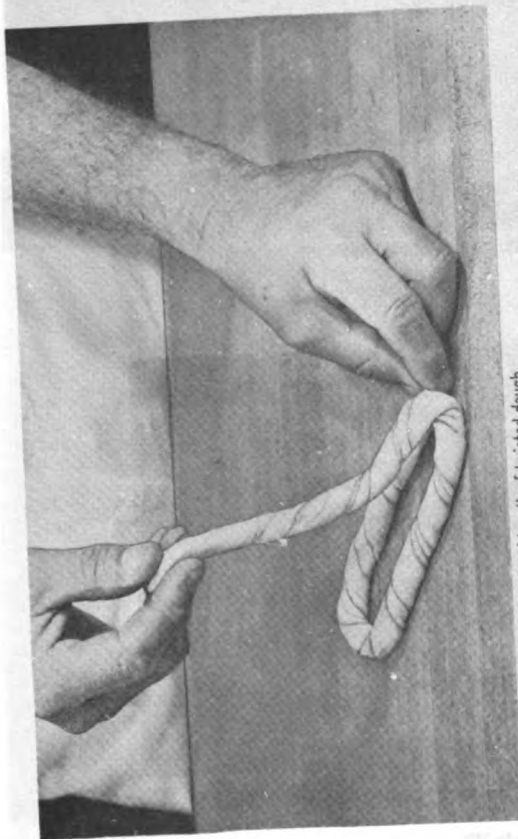


Form double snail by curling both ends of twisted dough toward center.

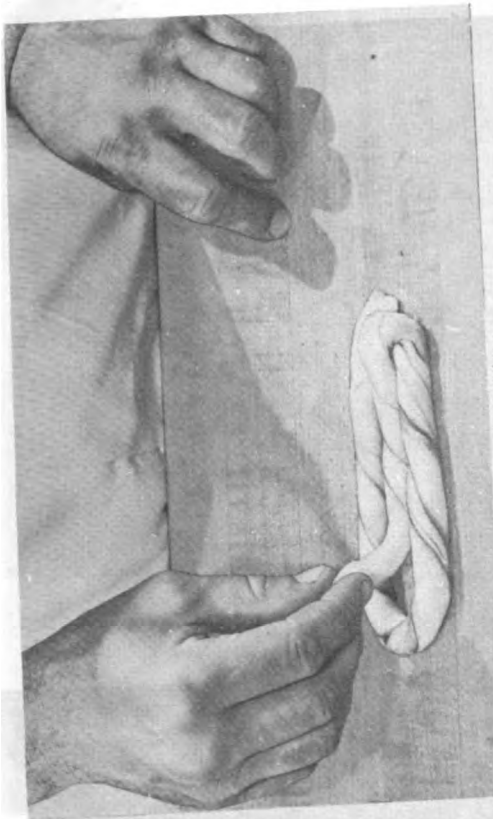


Form S by curling both ends of twisted dough counterclockwise.

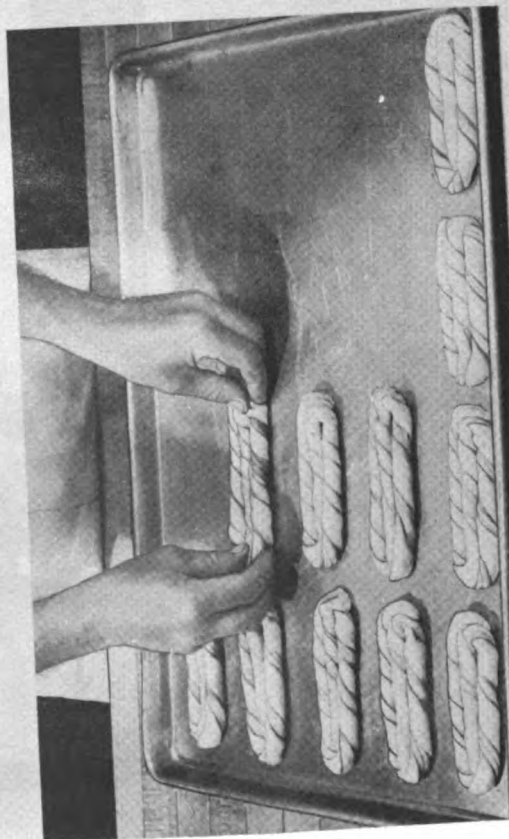
Figure 65. Methods of making snails, double snails, and S's.



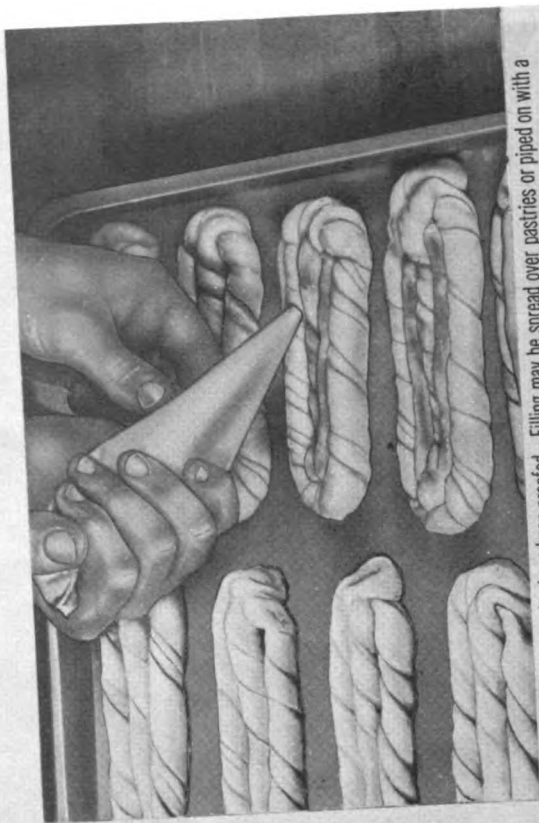
1. Form loop with about two-thirds of length of twisted dough.



2. Place loose end in center of loop, forming three parallel rows.

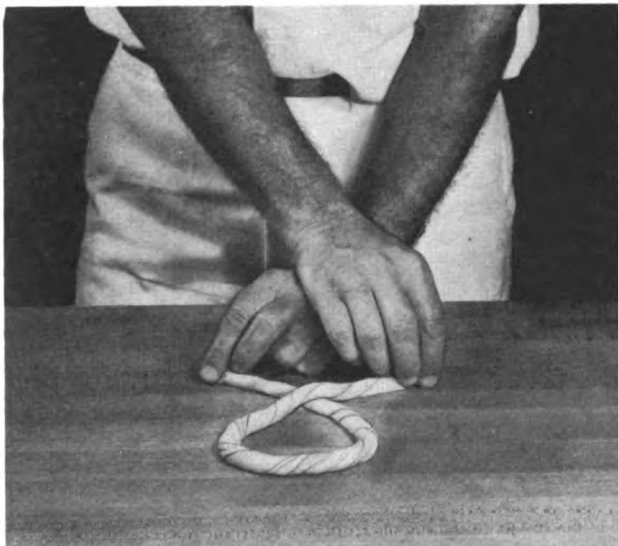


3. Pan pastries in rows four by five.



4. Add filling after pastries have been proofed. Filling may be spread over pastries or piped on with a paper cone.

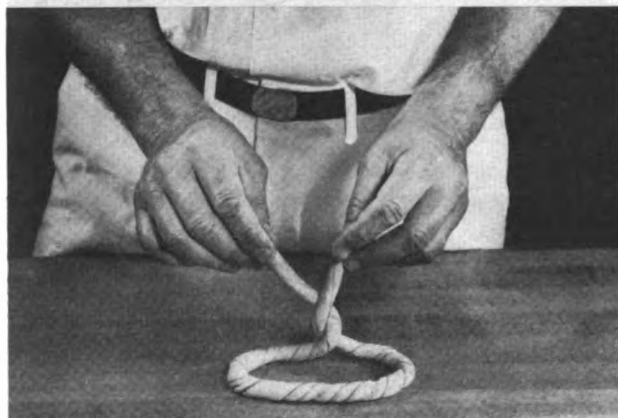
Figure 66. Making pineapples.



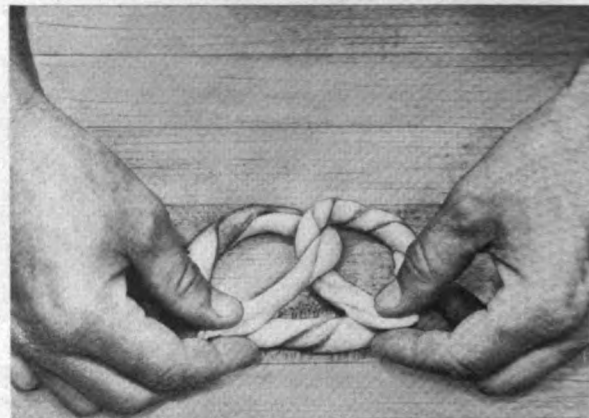
1. Form a circle with twisted dough, overlapping ends.



2. Twist ends around each other.



3. Raise ends and move them toward opposite side of circle.

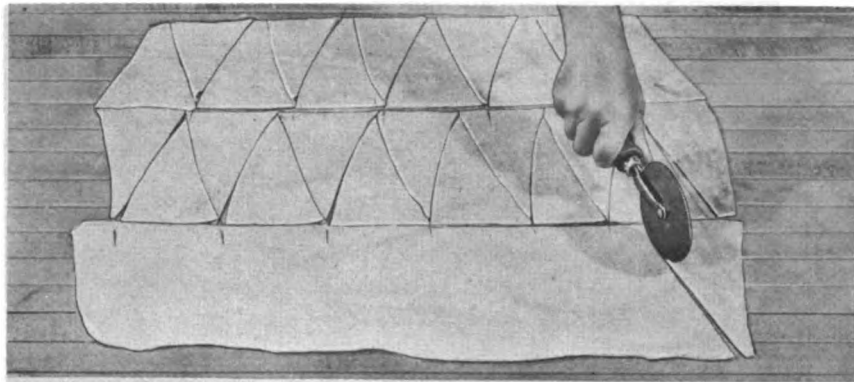


4. Press ends into opposite side of circle.

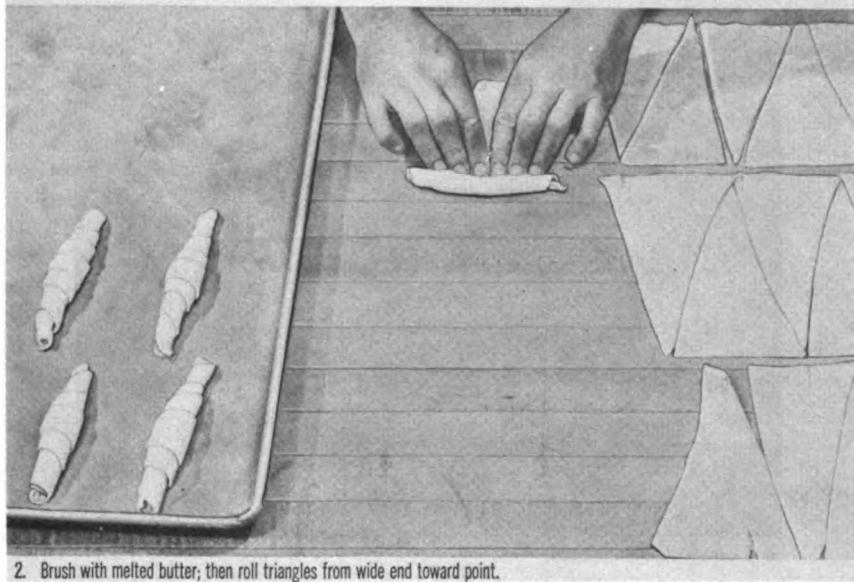


5. Reverse pretzels and pan in rows four by four.

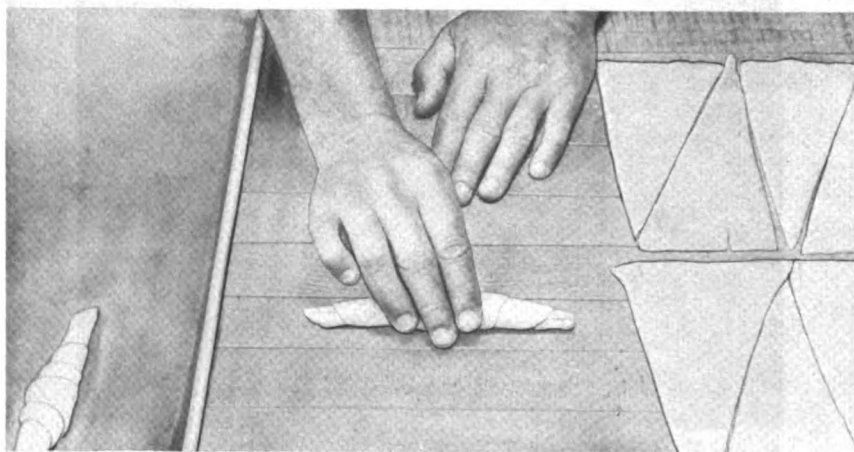
Figure 67. Making pretzels.



1. Roll dough to 1/4-inch thickness. Cut dough lengthwise into strips approximately 5 inches wide; then cut strips into triangles approximately 3 inches wide at the base.

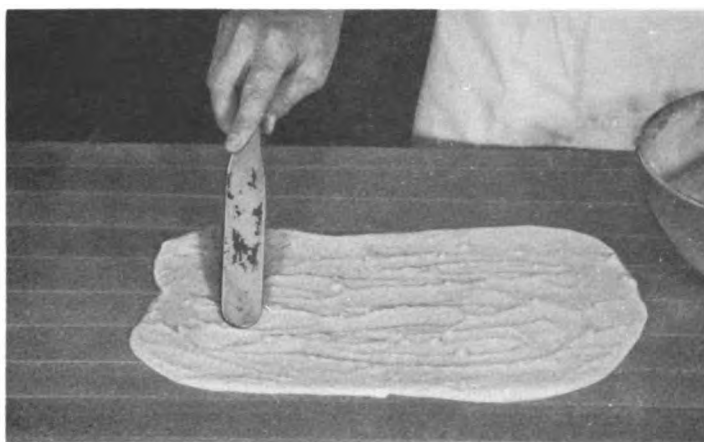


2. Brush with melted butter; then roll triangles from wide end toward point.

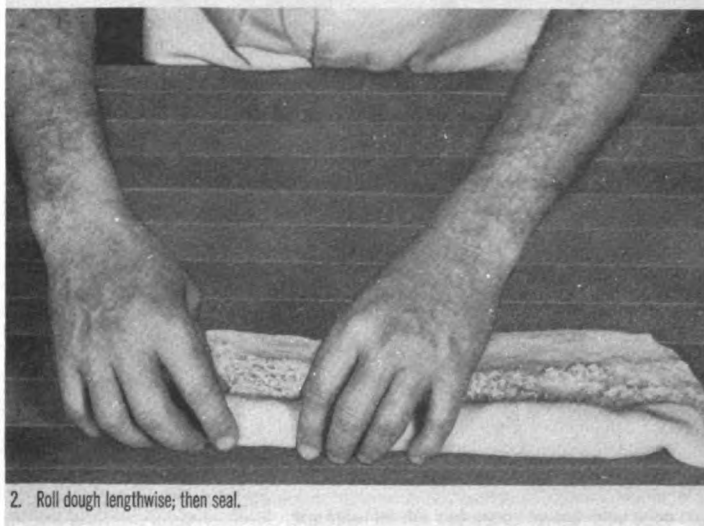


3. Place point on underside; pan in rows four by eight.

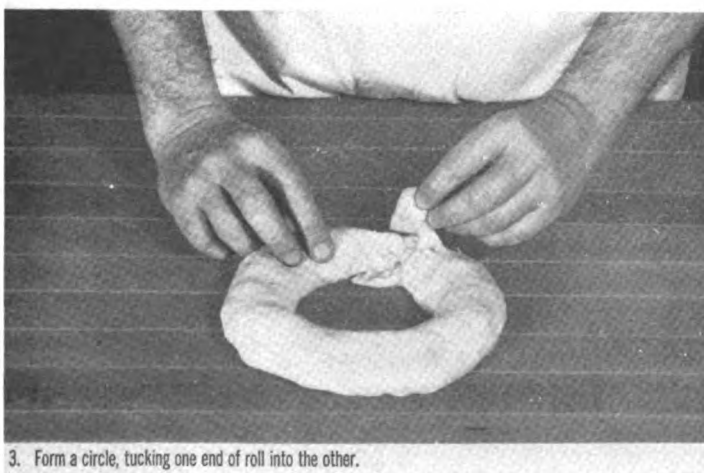
Figure 68. Making butterhorns.



1. Roll dough to 1/4-inch thickness and spread filling on dough; leave strip down side for sealing.



2. Roll dough lengthwise; then seal.



3. Form a circle, tucking one end of roll into the other.

Figure 69. Making coffee ring.

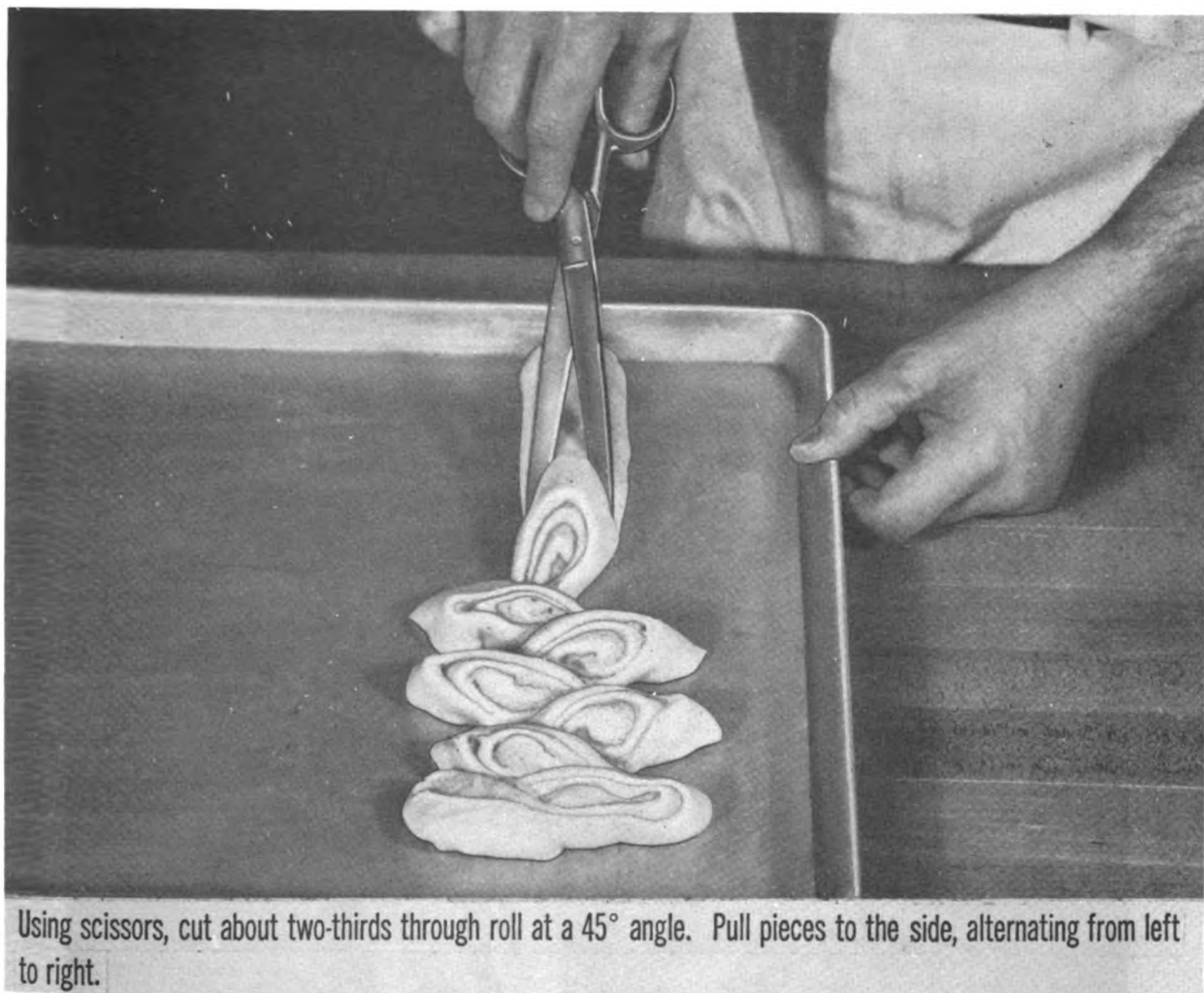


Figure 70. Making alligator coffeecake.

layers. Proper baking time and temperature are important in the preparation of danish pastry, and the time and temperature speci-

fied in the recipe should be followed exactly. If the oven temperature is too low, the roll-in material will melt and leak out of the layers.

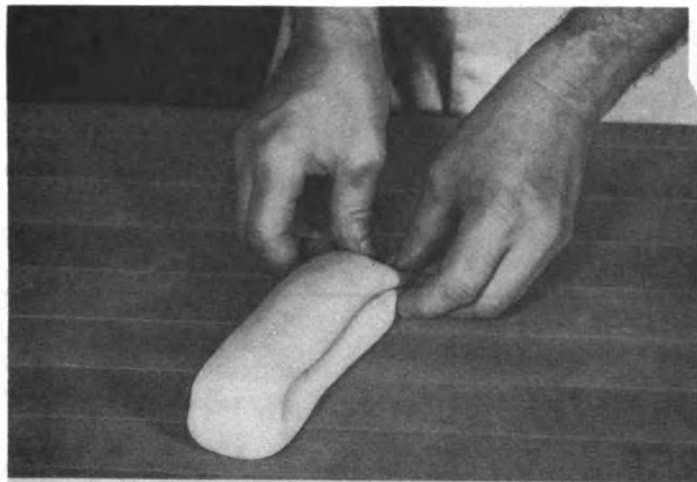


1. Using scraper blade, split roll down center to within 1 inch of end.



2. Twist strips over and under to form desired shape.

Figure 71. Making twist coffecake.



1. Place roll on table, seam side up; then fold from front to back and press ends together.



2. Cut down center to within about 1 inch of pressed ends of roll.



3. Open roll carefully to form heart shape.

Figure 72. Making heart-shaped coffecake.

APPENDIX I

REFERENCES

1. Army References

AR 30-11	Army Food Program.
AR 30-15	Table of Food Equivalents.
AR 30-40	Rations.
AR 30-41	Field Rations and Mess Operations.
AR 30-55	Central Pastry Kitchens.
AR 30-60	Garrison Bread Bakeries.
AR 30-741	Classification and Care of Subsistence Stores.
AR 31-20	Annual Food Plans, Master Menus, and Menu Boards.
AR 31-192	Food Facilities Summary.
AR 31-200	Army Commissary Operating Procedures.
AR 40-5	Preventive Medicine.
AR 40-657	Veterinary Food Inspection.
AR 210-17	Inactivation of Command Installations.
AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.
AR 320-60	Office Symbols.
AR 350-5	Military Education and Service Schools.
AR 385-10	Army Safety Program.
AR 385-40	Accident Reporting and Records.
AR 420-22	Preventive Maintenance.
AR 420-47	Refuse Collection and Disposal.
AR 420-55	Food Service and Related Equipment.
AR 420-76	Entomology Services.
AR 420-90	Fire Prevention and Protection.
AR 725-50	Requisitioning, Receipt, and Issue System.
DA Pam 20-551	Staffing Guide for U.S. Army Garrisons.
DA Pam 108-1	Motion Pictures, Filmstrips, Slides, Tapes, and Phono-Recordings.
DA Pam 310-series	Military Publications Indexes (as applicable).
FM 21-5	Military Training Management.
FM 21-6	Techniques of Military Instruction.
FM 21-10	Military Sanitation.
FM 21-30	Military Symbols.
JCS Pub 1	Dictionary of United States Military Terms for Joint Usage.
SB 10-260	Master Menu.
SB 10-260-1	Recapitulation of Master Menu Issues.
TA 50-911	Equipment for Food Service Facilities Serving Field Installations, Troop and Hospital Trains, and Army Vessels.
TA 50-986	Allowances of Expendable Supplies to Supplement Equipment of Food Service Facilities Serving Field Installations, Troop and Hospital Trains, and Army Vessels.

TM 5-637	Inspection and Preventive Maintenance Services for Kitchen Equipment.
TM 5-640	Ranges, Bake Ovens, and Burners for Mess Equipment; Repairs and Utilities.
TM 8-501	Nutrition.
TM 8-525	Sanitary Food Service.
TM 10-210	Inspection and Storage of Subsistence Supplies.
TM 10-401	The Army Food Adviser.
TM 10-404	Ration Breakdown Point Operations.
TM 10-405	Army Mess Operations.
TM 10-410	Bread Baking.
TM 10-412-series	Army Recipes.
TM 10-415	Operation of Garrison Mess Equipment.
TM 10-419	Preparation and Serving of Food in the Garrison Mess.

2. Air Force References

AF TA 504	Current Allowance Document—Food Service (Non-Tactical).
AFM 26-3	Criteria and Standards.
AFM 67-1	USAF Supply Manual.
AFM 88-2	Definitive Designs of AF Structures.
AFM 88-15	Standard Outline Specifications for AF Facilities.
AFM 145-1	Commissary and Subsistence Depot Operating Manual.
AFM 146-1	Food Service Management.
AFM 146-5	Bread Baking.
AFM 146-7	Instructor's Guide—Sanitary Techniques and Personal Hygiene.
AFM 146-8	Operation and First Echelon Maintenance of Food Service Equipment.
AFM 146-12	Recipes.
AFM-161-6	Medical Aspects of Food Service (Food Poisoning and Food Inspection).
AFP 146-1-series	Master Menu.
AFP 146-2-series	Recap of Master Menu Issues.
AFR 0-2	Numerical Index of Standard Air Force Publications.
AFR 0-9	Numerical Index of Departmental Forms.
AFR 145-1	Air Force Subsistence Program.
AFR 145-7	Monetary Value of Field Ration "A".
AFR 145-21	Rations.
AFR 160-48	Veterinary Food Inspection.
AFR 160-95	Nutrition.
AFR 163-1	Veterinary Service, United States Air Force.

APPENDIX II

BAKING CAKES AT HIGH ALTITUDES

1. Formula Adjustments

Cake formulas usually are developed and balanced at or near sea level. When cakes are made at altitudes above 2,000 feet, certain formula adjustments must be made because of changes in the air pressure which primarily affect the action of the leavening agents. For example, the same amount of carbon dioxide gas generated by baking powder at sea level will take up a fifth more space at an altitude of 5,000 feet. The following formula adjustments are recommended for cakes made at high altitudes.

a. Leavening Agents. Beginning at 2,000 feet above sea level, reduce leavening (baking powder, soda, or cream of tartar) 15 percent; reduce leavening an additional $7\frac{1}{2}$ percent for each additional 1,000 feet of altitude. At 8,000 feet, the reduction in leavening will amount to 60 percent.

b. Eggs. Beginning at 2,500 feet above sea level, add $2\frac{1}{2}$ percent more whole eggs or egg whites. Gradually increase the egg content as the elevation increases, until at 7,500 feet the egg content will have been increased by 15 percent.

c. Flour. Beginning at 3,500 feet elevation,

increase the flour $2\frac{1}{2}$ percent. Gradually add more flour as the elevation increases, until at 8,000 feet the flour will have been increased by 10 percent.

d. Fat. Beginning at 2,000 feet above sea level, reduce fat 2 percent for each additional 1,000 feet of altitude.

e. Liquids. Starting at 2,000 feet above sea level, increase total liquids (whole milk, water, and fruit juice) approximately 5 percent. Gradually increase liquids until at 6,500 feet liquids will have been increased by 20 percent.

f. Sugar. For each 1,000 feet of altitude above sea level, reduce the sugar in batter cakes 2 to $2\frac{1}{2}$ percent; in angel food cakes, $3\frac{1}{2}$ percent; and in sponge cakes, 4 percent.

2. Other Changes

Cakes have a tendency to stick at high altitudes; therefore, the pans used for baking cakes at high altitudes should be greased and dusted more thoroughly than those used at sea level. At elevations of 3,500 feet or more, increase the oven temperature 25° F. Keep the baking time the same as at sea level, but take precautions to avoid overbaking; at higher altitudes evaporation takes place at a greater rate.

APPENDIX III

EFFECT OF ALTITUDE ON BOILING POINT OF WATER

Feet above sea level	Boiling point of water ° F.	Feet above sea level	Boiling point of water ° F.
0	212	7,520	198
500	211	8,080	197
1,000	210	8,640	196
1,500	209	9,200	195
2,000	208	9,760	194
2,500	207	10,320	193
3,000	206	10,880	192
3,500	205	11,440	191
4,000	204	12,000	190
4,500	203	12,560	189
5,000	202	13,120	188
5,280 (1 mile)	201.56	13,680	187
5,840	201	14,240	186
6,400	200	14,800	185
6,960	199		

APPENDIX IV **TRANSPOSITION VALUES FOR CHOCOLATE AND COCOA**

Cocoa for chocolate						Chocolate for cocoa					
To replace chocolate		Use cocoa		Increase shortening		To replace cocoa		Use chocolate		Reduce shortening	
lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
	4		3		1		4		6		1
	8		5		2		8		13		2
	12		8		2		12	1	3		4
1			10		3	1		1	10		5
2		1	4		6	2		3	3		10
4		2	8		12	4		6	6	1	3
6		3	12	1	2	6		9	9	1	13
8		5	—	1	8	8		12	12	2	6
12		6	4	1	14	10		16	—	3	—

APPENDIX V

TABLE OF EQUIVALENT WEIGHTS AND MEASURES OF SPECIFIC FOODS

	Tablespoon	Standard measuring cup	Pint measure		Quart measure	
	Ounces	Ounces	Pounds	Ounces	Pounds	Ounces
Allspice	$\frac{1}{4}$	4				
Apples, dehydrated				4		
Apples, fresh, diced					1	
Applesauce		8	1			
Apricots, dried		$5\frac{1}{2}$		$10\frac{1}{2}$	1	5
Bacon, diced, raw				$10\frac{1}{2}$		
Butter, solid pack		8	1		2	
Carrots, diced, raw					1	3
Chocolate, grated	$\frac{1}{4}$	4		8	1	
Chocolate, melted		8	1		2	
Cinnamon, ground	$\frac{1}{4}$	$3\frac{1}{2}$				
Cloves, ground	$\frac{1}{4}$	4				
Cocoa		4		8	1	
Coconut, shredded		$2\frac{1}{2}$		$5\frac{1}{2}$		$10\frac{1}{2}$
Cornmeal		6		12	1	8
Cornstarch	$\frac{1}{3}$	$5\frac{1}{2}$		1		5
Cream of tartar	$\frac{1}{3}$	$5\frac{1}{2}$				
Currants, dried		$5\frac{1}{2}$		$10\frac{1}{2}$	1	5
Egg whites		8	1		2	
Eggs, whole, dried	$\frac{1}{4}$	3		6		12
Eggs, whole, without shell		8	1		2	
Egg yolks		8	1		2	
Extract, lemon or vanilla	$\frac{1}{2}$					
Flour, wheat, hard, sifted	$\frac{1}{4}$	4		8	1	
Flour, wheat, hard, unsifted		$4\frac{1}{2}$		9	1	2
Flour, wheat, soft, sifted		$3\frac{1}{2}$		7		14
Flour, wheat, soft, unsifted	$\frac{1}{4}$	$4\frac{1}{2}$		9	1	2
Gelatin powder, flavored	$\frac{1}{4}$	$5\frac{1}{4}$		$10\frac{1}{2}$	1	5
Ginger, ground	$\frac{1}{4}$	$3\frac{3}{4}$		$9\frac{1}{2}$	1	3
Honey		12	1	8	3	
Mace	$\frac{1}{4}$					
Milk, whole, evaporated	$\frac{1}{2}$	$8\frac{3}{4}$	1	2	2	8
Milk, whole, powered	$\frac{1}{4}$	4		8	1	
Mixed spices	$\frac{1}{4}$	$3\frac{1}{2}$				
Molasses		12	1	8	3	
Nutmeg, ground	$\frac{1}{4}$	$4\frac{1}{4}$				
Oats, rolled		$2\frac{1}{2}$		$5\frac{1}{2}$		$10\frac{1}{2}$
Oil, cooking or salad		8	1		2	
Peanut butter		9	1	2	2	4
Pepper, ground	$\frac{1}{4}$					
Powder, baking	$\frac{3}{8}$	6		12	1	8
Prunes, evaporated		$5\frac{1}{4}$		$10\frac{1}{2}$	1	5
Raisins		$5\frac{1}{2}$		$10\frac{1}{2}$	1	5
Salt		10	1	4	2	8
Sirup, corn		$11\frac{1}{2}$	1	7	2	12

	Tablespoon	Standard measuring cup	Pint measure		Quart measure	
	Ounces	Ounces	Pounds	Ounces	Pounds	Ounces
Soda, baking -----	$\frac{1}{2}$	8	1	-----	2	-----
Sugar, brown (loose pack) -----	$\frac{1}{4}$	$5\frac{1}{4}$	-----	$10\frac{1}{2}$	1	5
Sugar, granulated -----	-----	7	-----	14	1	12
Sugar, powered -----	$\frac{1}{4}$	$4\frac{3}{4}$	-----	$9\frac{1}{2}$	1	3
Vinegar -----	$\frac{1}{2}$	$8\frac{1}{4}$	1	$\frac{1}{2}$	2	1
Water -----	-----	8	1	-----	2	-----
Yeast, active dry -----	$\frac{1}{8}$	5	-----	10	1	4
Yeast, compressed -----	$1\frac{1}{2}$	8	1	-----	2	-----
-----	-----	-----	(packed)	-----	(packed)	-----

APPENDIX VI

BROWN-AND-SERVE ROLLS

1. General

a. Brown-and-serve rolls can be prepared in the central pastry kitchen and delivered to the mess; the rolls can then be browned in the mess just prior to serving time. As a result, the soldier will receive hot, freshly baked rolls instead of baked rolls that have been heated over.

b. The successful production of brown-and-serve rolls requires the proper balance between formula, fermentation, proofing, and preliminary baking time and temperature. The objective is to bake yeast-raised products to a point of rigidity and full volume before there is any semblance of crust color.

2. Formula

The roll formula shown below was developed for the brown-and-serve process and is offered as a guide.

Brown-and-Serve Dinner Rolls and Buns

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Sugar, granulated.	1	5	Step 1. Place all ingredients	8
Salt	0	4½	of this step	2
Shortening	1	10	into the mixing	12
Eggs	0	13	bowl and mix	6
Water*	7	0	until sugar and salt are dissolved.	50
Flour, hard	14	0	Step 2. Sift	100
Milk, nonfat, dry.	0	12	flour and dry milk together.	5.35

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Yeast, active dry.	0	2¼	Add to above.	
Water	0	12	Suspend yeast in water, add on top of flour, and mix until smooth. Do not mix to full gluten development.	1 5.35

* The amount of liquid will vary according to the type of flour used. Temper the water to make dough 88° to 90° F.

3. Fermentation Time

Allow dough to ferment at room temperature (preferably 75° to 80° for 1¾ to 2 hours (one full rise without punching)); then take dough to the bench and make it up immediately.

4. Makeup Suggestions

Brown-and-serve rolls can be made up, or shaped, in the same ways as regular rolls. However, it is suggested that soft dinner rolls and buns be on the small side. Table 11 may be used as a guide for scaling dough in central pastry kitchens where a roll divider is available.

Note. If a small roll (½ ounce, for example) is desired, it may be difficult, if not impossible, to obtain an accurate division of 36 pieces in the divider press because the amount of dough to be divided (18 ounces) is so small. It is possible, however, to obtain a roll weighing ½ ounce by doubling the weight per press (2 pounds, 4 ounces) and after dividing it into 36 pieces to separate each piece by hand into 2 equal parts.

Table 11. Brown-and-Serve Roll Scaling Guide

<i>Wt per individual unit</i>	<i>Wt per dozen unit</i>		<i>Wt per press</i>	
<i>Ounces</i>	<i>Pounds</i>	<i>ounces</i>	<i>Pounds</i>	<i>ounces</i>
At least ¼ but less than ½ -----		3		9
		4		12
		5		15

*Table 11. Brown-and-Serve Roll Scaling Guide—
Continued*

Wt per individual unit	Wt per dozen unit		Wt per press	
Ounces	Pounds	ounces	Pounds	ounces
At least $\frac{1}{2}$ but less than $\frac{3}{4}$ -----		6	1	2
		7	1	5
		8	1	8
At least $\frac{3}{4}$ but less than 1 -----		9	1	11
		10	1	14
		11	2	1
At least 1 but less than $1\frac{1}{4}$ -----		12	2	4
		13	2	7
		14	2	10
At least $1\frac{1}{4}$ but less than $1\frac{1}{2}$ -----		15	2	13
	1		3	
	1	1	3	3
At least $1\frac{1}{2}$ but less than $1\frac{3}{4}$ -----	1	2	3	6
	1	3	3	9
	1	4	3	12
At least $1\frac{3}{4}$ but less than 2 -----	1	5	3	15
	1	6	4	2
	1	7	4	5

5. Proofing

Proofbox temperatures should be at least as warm as for regular rolls (95° to 96° F.) and preferably warmer. From 98° to 105° F. is best. Proof rolls approximately three-fourths as high as regular rolls. A slightly shorter proofing period is advisable, since this type of roll expands considerably as it bakes. Do not proof rolls until they are "light to the touch."

6. Baking

Oven temperature should be between 275° to 300° F. The oven should have an even heat. Bake as long as possible without coloring the rolls. When fully processed, the rolls should be white in color and fully formed and should have good body for ease in handling.

7. Handling After Baking

Allow rolls to cool approximately 10 to 20 minutes; then remove from baking pans and place in clean sheet pans. Do not leave rolls in baking pans too long, or they will "sweat" and it will be difficult to remove them from the pan.

8. Tea Biscuits

Scale dough into pieces of the desired size

and round up. Place rolls in a lightly greased 9-inch round baking tin. Give a medium to short proofing period before baking. Keep the weight of individual dough pieces as small as possible and bake 14 to 18 small tea biscuits in a 9-inch round baking tin.

9. Finger Pan Rolls

Scale dough into pieces of the desired size (keep them small); round up. After allowing a short recovery period, roll dough pieces into cylinders approximately 4 inches long. Place 5 rows of 12 rolls each in a standard 18- by 25-inch bun pan. Give a medium proofing period and bake.

10. Hotdog Buns

Scale dough into pieces of the desired size; round up. After a short recovery period, roll rounded dough pieces into cylinders approximately 6 inches long. Pan on baking sheets, leaving space between rolls. Give a medium short proofing period and bake.

11. Butter Gem Rolls

The fermented dough should be scaled into 5-pound pieces, flattened by hand, and semi-

molded into a large loaf about 24 inches long. Allow approximately 10 minutes intermediate proofing period. Roll each loaf with rolling pin about $\frac{1}{2}$ inch thick. Spread with soft or melted butter or with any combination of butter and shortening (about 4 ounces per pound of dough). Roll dough into a long cylinder about 2 inches in diameter. Use a sharp knife or scraper and cut cylinder into pieces of the desired size. Place pieces of dough on baking

sheet, set in proofbox (approximately 90° F.), and give a medium short proofing period before baking. This type of butter gem roll can be proofed at room temperature; however, the proofing time may be longer.

12. Browning Rolls at the Mess

Preheat oven to approximately 400° F. Allow rolls to remain in oven for approximately 8 minutes. Serve hot.

APPENDIX VII

RECIPES FOR MACHINE-MADE COOKIES

1. Orange-Pecan Cookies

Yield: 691 ounces or 1,105 $\frac{5}{8}$ -ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, granulated.	12	0	(except pecans) together	75
Milk, nonfat, dry.	0	5½	twice, place all ingredients	2
Salt	0	2½	in the mixing	1
Soda	0	2½	bowl and mix	1
Shortening	6	0	at slow	37.5
Eggs	1	14¾	speed to a	12
Water	2	11½	smooth dough	19
Orange juice	2	0	(1 to 2	12.5
Orange extract	0	3¼	minutes).	1.25
Pecans, chopped	2	0		12.5

Drop by machine, using 2-inch die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Oven temperature: 390° to 400° F.

Baking time: 10 to 12 minutes.

2. Chocolate Crunchies

Yield: 650 ounces or 1,040 $\frac{5}{8}$ -ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	6	12	Sift all dry	75
Flour, hard	2	4	ingredients	25
			(except pecans)	
Sugar, brown	9	10	together	107
Salt	0	3¾	twice.	2.5
Soda, baking	0	1¼	Place all	0.75
Shortening	6	9	ingredients	73
Sirup, white	8	0	in the	67
Bitter Chocolate, melted.	2	7	mixing bowl	27
			and mix at	
Eggs	4	12	slow speed to a	53
Vanilla	0	2½	smooth dough (1	1.5
Pecans, chopped	1	13	to 2 minutes).	20

Drop by machine, using 2½-inch die.

Grease pans lightly.

Scaling weight: 8 to 10 ounces per dozen.

Oven temperature: 390° to 400° F.

Baking time: 10 to 12 minutes.

3. Molasses Cookies

Yield: 760 ounces or 1,520 $\frac{1}{2}$ -ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	14	4	Sift all dry	75
Flour, hard	4	12	ingredients	25
Sugar, brown	10	7	together	55
Salt	0	1½	twice. Place	0.50
Soda, baking	0	7	all ingredients	2.25
Cloves	0	¾	in the mixing	0.25
Cinnamon	0	1½	bowl and	0.50
Ginger	0	1½	mix at slow	0.50
Shortening	9	2	speed to a	48
Eggs	3	0	smooth dough	16
Molasses	5	2	(1 to 2 minutes).	27

Drop by machine, using a small-holed die.

Grease pans lightly.

Scaling weight: 6 to 9 ounces per dozen.

Oven temperature: 375° F.

Baking time: 12 to 14 minutes.

4. Lemon Snaps

Yield: 629 ounces or 1,006 $\frac{5}{8}$ -ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, granulated.	12	0	together	75
Milk, nonfat, dry.	0	4	twice. Place	
			in the mixing	1.5
Salt	0	3	bowl and	
Soda, baking	0	3	mix at	1.25
Shortening	6	0	slow speed	1.25
Eggs	1	12	to a smooth	37.5
Water	2	8	dough (1 to	10.5
Lemon juice	0	7	2 minutes).	17
Lemon extract	0	3		3
				1.25

Drop by machine, using a small-holed die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Oven temperature: 390° to 400° F.
Baking time: 12 to 14 minutes.

5. Sugar Cookies

Yield: 462 ounces or 739 5/8-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	9	0	Sift all dry	75
Flour, hard	3	0	ingredients	25
Sugar, granulated.	8	0	together twice.	67
Milk, nonfat, dry.	0	3	Place all ingredients	1.5
Salt	0	2	in the mixing	1
Soda, baking	0	1 1/2	bowl and mix	.75
Cream of tartar	0	2	at slow	1
Nutmeg	0	1/2	speed to a	.25
Shortening	5	0	smooth dough	42
Water	1	13	(1 to 2	17
Eggs	1	8	minutes).	12.5
Vanilla	0	4		2

Drop by machine, using 2 1/2-inch die.
Grease pans lightly.
Scaling weight: 7 to 8 ounces per dozen.
Oven temperature: 390° to 400° F.
Baking time: 12 to 14 minutes.

6. Shortbread Cookies

Yield: 581 ounces or 1,162 1/2-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, granulated.	7	3 1/4	together twice. Place	45
Milk, nonfat, dry.	0	4 1/4	all ingredients in the	1.75
Salt	0	3 1/4	mixing bowl	1.25
Baking powder	0	3 1/4	and mix at	1.25
Shortening	3	9 1/4	slow speed	22.5
Butter	3	9 1/4	to a smooth	22.5
Sirup, white	0	13	dough (1 to	5
Eggs	1	9 1/4	2 minutes).	10
Water	2	14 1/4		20
Vanilla	0	3 1/4		1.25

Drop by machine, using 1-inch round die.
Grease pans lightly.
Scaling weight: 6 ounces per dozen.
Oven temperature: 390° to 400° F.
Baking time: 12 to 14 minutes.

Note. For a popular variation, sift 5 ounces of cinnamon with dry ingredients.

7. Peanut Butter Cookies

Yield: 717 ounces or 1,147 5/8-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, brown	7	0	together	44
Salt	0	5 1/4	twice. Place	2
Soda	0	3 1/4	all ingredients	1.5
Shortening	5	4	in the mixing	33
Peanut butter	7	0	bowl and mix	44
Eggs	2	9	at slow speed	16
Sirup, white	5	4	to a smooth	33
Water	1	0	dough (1 to	6
Vanilla	0	3 1/4	2 minutes).	1.5

Drop by machine, using 2 1/2-inch die.
Grease pans lightly.
Scaling weight: 7 to 8 ounces.
Oven temperature: 390° to 400° F.
Baking time: 10 to 12 minutes.

8. Pumpkin Cookies

Yield: 800 ounces or 914 7/8-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	9	0	Sift all dry	60
Flour, hard	6	0	ingredients	40
Sugar, brown	13	8	(except	90
Milk, nonfat, dry.	0	6 1/2	pecans) together	2.75
Salt	0	3	twice.	1.25
Soda, baking	0	6	Place all	2.5
Cinnamon	0	1 1/2	ingredients	0.625
Ginger	0	3/4	in the	0.3125
Allspice	0	3/4	mixing bowl	0.3125
Shortening	6	0	and mix at	40
Pumpkin, canned.	6	0	slow speed to a	40
Water	4	1 1/2	smooth dough (1 to 2	30
Pecans, chopped	4	8	minutes).	80

Drop by machine, using 2-inch die.
Grease pans lightly.
Scaling weight: 10 to 12 ounces per dozen.
Oven temperature: 400° F.
Baking time: 10 to 12 minutes.

9. Spice Cookies

Yield: 657 ounces or 1,051 5/8-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, granulated.	9	2	together	57
Milk, nonfat, dry.	0	3 1/4	twice. Place	1.25
Salt	0	3 1/4	all ingredients in the	1.25
			mixing	

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>percent</i>
Soda, baking	0	4½	bowl and	1.75
Cinnamon	0	¾	mix at	0.25
Allspice	0	¾	slow speed	0.25
Shortening	5	2	to a smooth	32
Eggs	1	2	dough (1 to	7
Water	2	1	2 minutes).	14
Molasses	6	14		43

Drop by machine, using a small-holed die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Baking temperature: 390° to 400° F.

Baking time: 10 to 12 minutes.

10. Oatmeal Cookies

Yield: 677 ounces or 1,083 ⅝-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	9	0	Sift all dry	75
Flour, hard	3	0	ingredients	25
Sugar, granulated.	9	10	(except oats and nuts)	80
Milk, nonfat, dry.	0	3½	together	1.75
Salt	0	3½	twice.	
Nutmeg	0	1	Place all	1.75
Soda, baking	0	2½	ingredients	0.50
Shortening	6	13	in the	1.25
Eggs	2	2	mixing bowl	57
Water	1	8½	and mix at	18
Raisins, ground	4	5	slow speed	14
Oats, rolled	4	5	to a smooth	36
Nuts, chopped	1	11	dough (1 to	36
			2 minutes).	14

Drop by machine, using 2-inch die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Oven temperature: 390° to 400° F.

Baking time: 10 to 12 minutes.

11. Scotch Cookies

Yield: 654 ounces or 1,046 ⅝-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	12	0	Sift all dry	75
Flour, hard	4	0	ingredients	25
Sugar, brown	10	12	together	67
Milk, nonfat, dry.	0	3¾	twice. Place	1.25
Salt	0	3¾	all ingredi-	
Soda, baking	0	4¼	ents in the	1.25
Shortening	8	0	mixing bowl	1.67
Eggs	3	11	and mix at	50
Water	1	13	slow speed to a	23
Vanilla	0	3¾	smooth dough (1	13
			to 2 minutes).	1.25

Drop by machine, using a small-holed die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Baking temperature: 390° to 400° F.

Baking time: 10 to 12 minutes.

12. Coconut Cookies

Yield: 719 ounces or 1,150 ⅝-ounce cookies.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>	<i>Baker's percent</i>
Flour, soft	9	12	Sift all dry	75
Flour, hard	3	4	ingredients	25
Sugar, granulated.	11	4	(except	87.5
Milk, nonfat, dry.	0	6	coconut)	
Salt	0	3	together	2.75
Soda, baking	0	1½	twice.	
Cream of tartar.	0	¾	Place all	1.5
Shortening	8	12	ingredients	0.75
Eggs	1	8	in the	0.375
Vanilla	0	2	mixing	
Water	3	10	bowl and	67.3
Macaroon coconut.	6	0	mix at slow	1.5
			speed to a smooth	30
			dough (1 to 2	1
			minutes).	46

Drop by machine, using 2½-inch die.

Grease pans lightly.

Scaling weight: 7 to 8 ounces per dozen.

Oven temperature: 390° to 400° F.

Baking time: 12 to 14 minutes.

APPENDIX VIII

PUFF PASTRY

1. General

Puff (french) pastry is considered to be a specialty item that tests the ability of the pastry cook. Cream horns, patty shells (fig. 73), and turnovers are made from the same puff paste dough. Cream horns are filled with a cream filling after they are baked and are then dusted with powdered sugar. Patty shells may be filled with meat, fruit, or cream filling after they have cooled. Turnovers are filled with fruit filling or jam before they are baked. Although puff pastry items are not made in the mess, there may be occasions when they will be made in the central pastry kitchen. For

this reason, instructions for the preparation of puff pastry are included in this text.

2. Recipe for Puff Paste Dough

Yield: Approximately 100 servings.

<i>Ingredients</i>	<i>Pounds</i>	<i>Ounces</i>	<i>Procedure</i>
Flour, hard	4	0	Step 1. Sift together and place in mixing bowl.
Salt	0	1	
Shortening (puff paste).	4	0	Step 2. Break up fat into small pieces. Blend into above ingredients.
Water, cold	2	4	Step 3. Add to above and mix slightly. Do not over-mix.
			Step 4. Place dough on

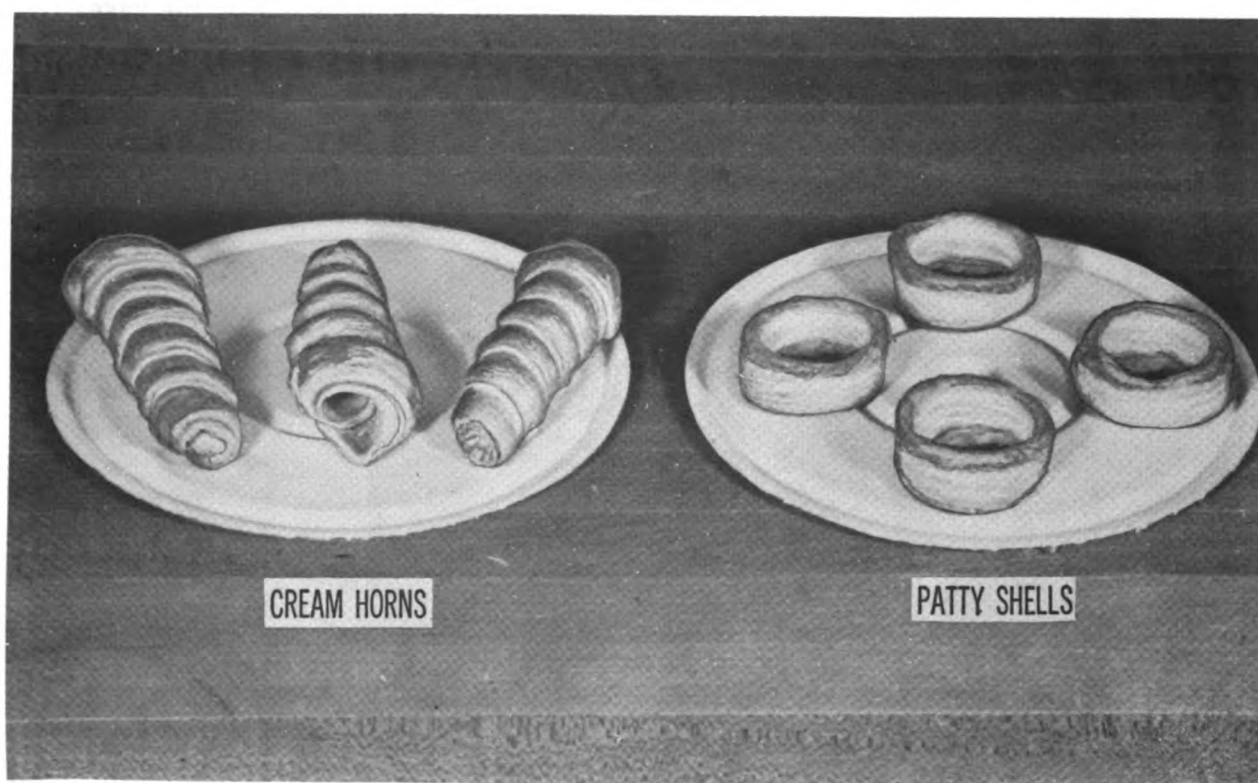


Figure 73. Puff pastry items.

floured bench and roll it into an oblong shape about $\frac{1}{8}$ inch thick. Lap dough over to form three folds. Let the dough relax for about 30 minutes. Repeat this step 4 times. Refrigerate the dough until makeup of the items is begun.

3. Makeup

a. Cream Horns. Figure 74 shows the steps for makeup of cream horns from puff paste dough.

Note. The cones are removed from the cream horns as soon as the cream horns come from the oven.

b. Patty Shells. Figure 75 shows the steps for makeup of patty shells from puff paste dough.

c. Turnovers. To make turnovers, roll the dough $\frac{1}{8}$ inch thick and cut into $4\frac{1}{2}$ -inch squares. Place fruit filling or jam in the center of each square, wash the edges of the dough, and fold each square over to form a triangle or an oblong.

4. Precautions

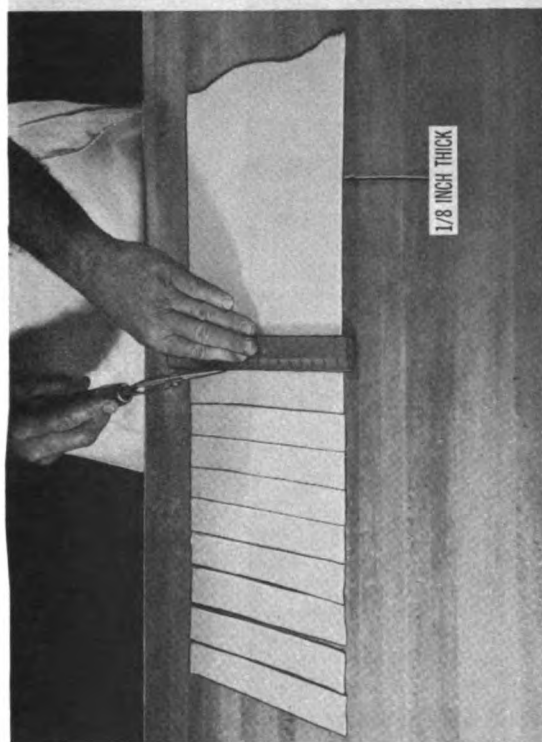
a. When folding the dough for patty shells (step 4 of recipe), be sure that all edges are properly squared. If the edges are not squared, the dough will have an uneven number of layers in some spots; and the patty shells may tip over during baking.

b. Do not fold dough more times than required in step 4. If the dough is folded too many times, the layers of dough and shortening will become so thin that they will be forced together. As a result, the finished items will be soggy and heavy.

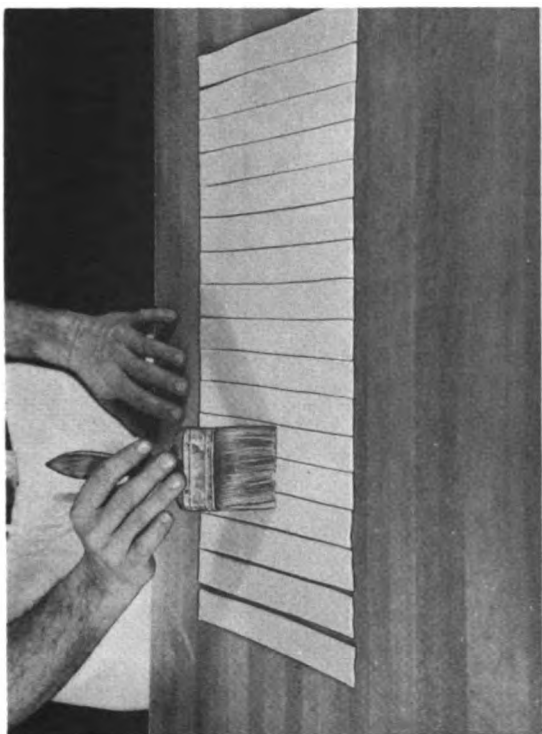
c. Overworking of the dough during any period of makeup will cause the layers to break down during baking and form a solid mass.

d. If excess dusting flour is not brushed from the dough, it will show up as raw flour in the finished product. This will make the layers dry and tough.

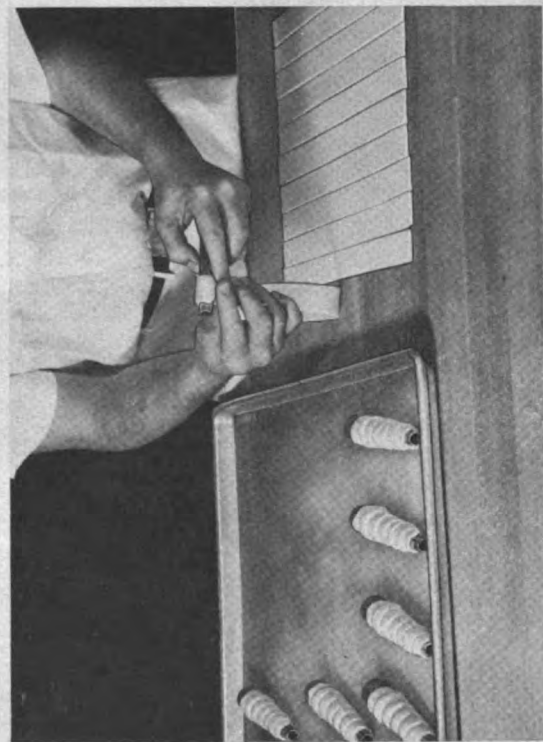
e. If the oven is too hot, the overlapped pieces of dough will be sealed quickly; and the finished pastries will lack volume and be raw in the center. If the oven is not hot enough, the fat will leak out and spoil the flake.



1. Cut rolled dough into strips approximately 1 1/2 inches wide and 14 inches long.



2. Brush dough strips with water.

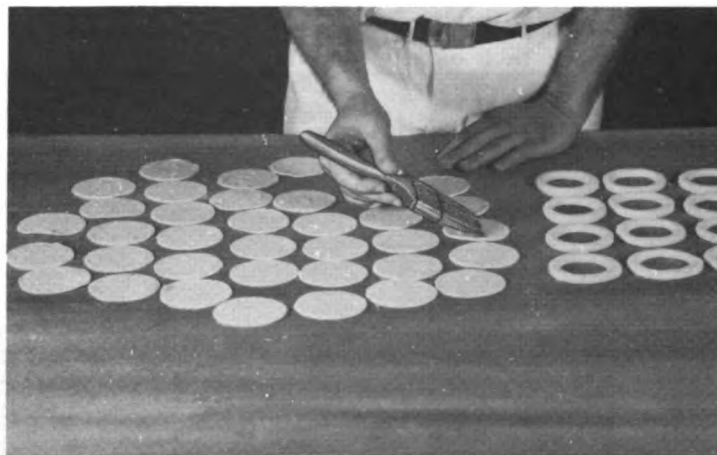


3. Roll dough onto metal or paper cone, starting at small end of cone.

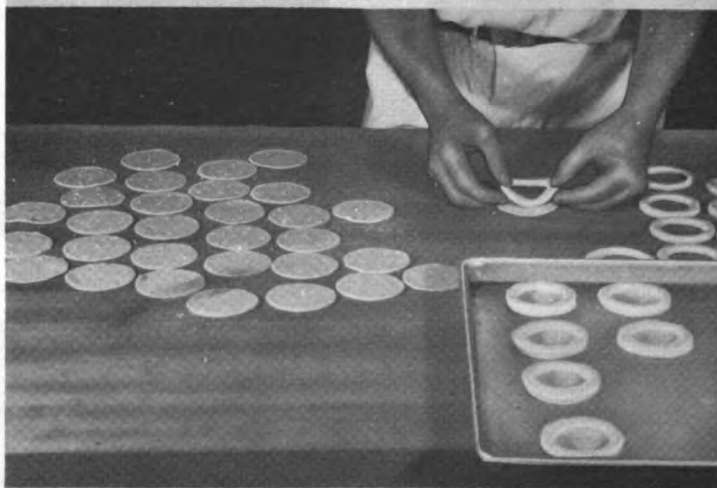


4. Complete roll by overlapping end of dough strip. Place overlapping end against pan.

Figure 74. Making up cream horns.



5. Brush shell bottoms with water.



6. Place ring on shell bottom, taking care to match edges evenly.



7. Prior to panning, shape patty shell carefully and make ring level.

Figure 75. Making up patty shells.

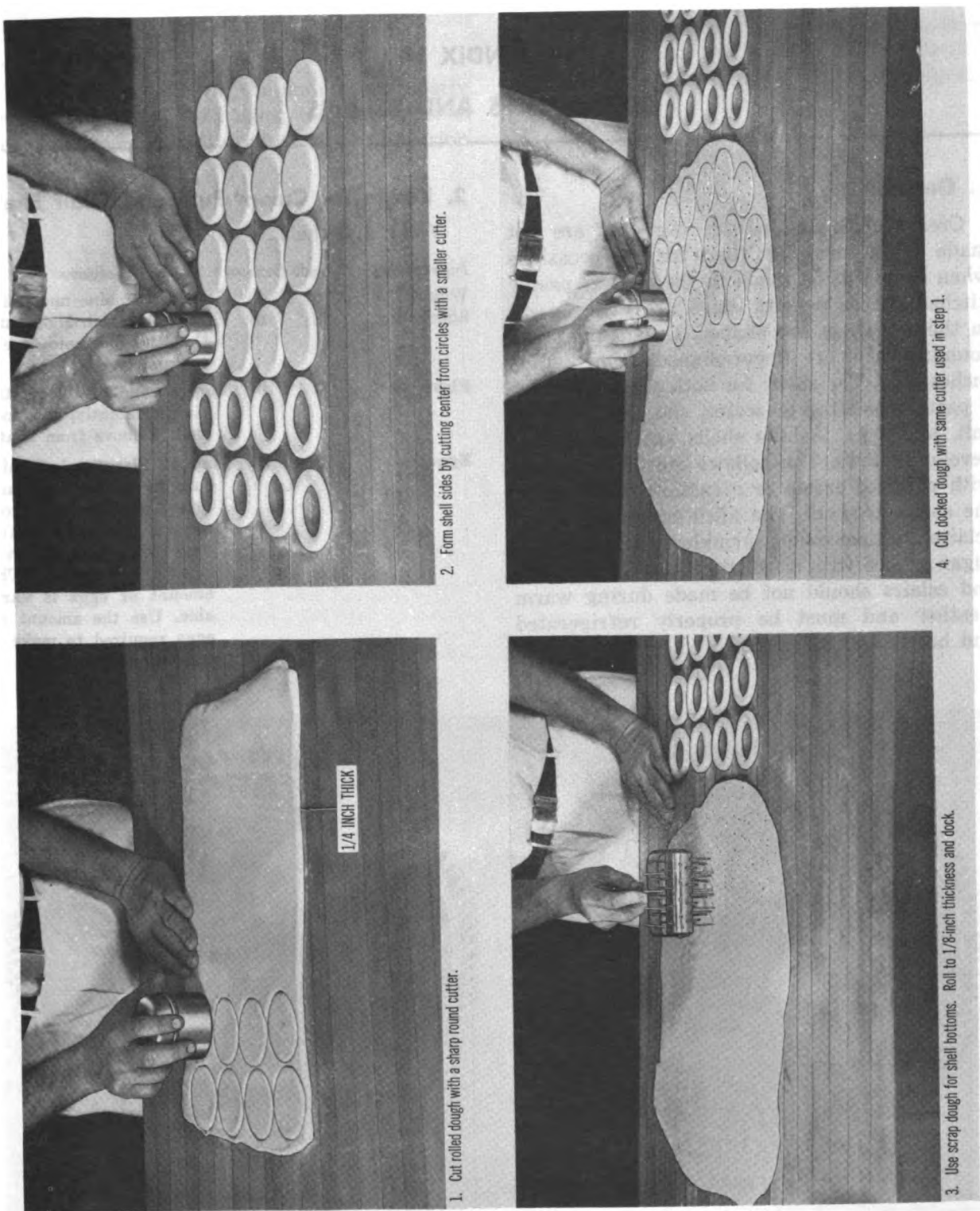


Figure 75—Continued.

APPENDIX IX

CREAM PUFFS AND ECLAIRS

1. General

Cream puffs and eclairs (fig. 76) are not made in the mess, but there may be occasions when they will be made in the central pastry kitchen. These dessert items are alike except in the way they are shaped. Cream puffs are round; eclairs are finger-shaped, from 2 to 4 inches long. The shells for both are made from a paste consisting of water, shortening, flour, salt, and eggs. As the shells are baked, they develop hollows. The hollows are filled, usually with whipped cream or a custard filling, after the shells are cool. The filled cream puffs and eclairs are then either sprinkled with powdered sugar or iced with chocolate icing. Cream puffs and eclairs should not be made during warm weather and must be properly refrigerated and handled at all times.

2. Recipe for Cream Puff and Eclair Shells

Yield: 100 shells.

<i>Ingredients</i>	<i>Pounds Ounces</i>		<i>Procedure</i>
Water	5	4	Step 1. Combine and bring to rolling boil. Make sure that the shortening melts completely.
Shortening	2	0	
Flour, hard	3	0	Step 2. Add to above, stirring constantly, and cook well. Remove from heat.
Eggs	5	4	Step 3. Place cooked mixture in mixing bowl and mix a few turns to cool mixture slightly. Add eggs slowly and mix to a smooth batter. The amount of eggs is variable. Use the amount of eggs required to make a smooth batter.

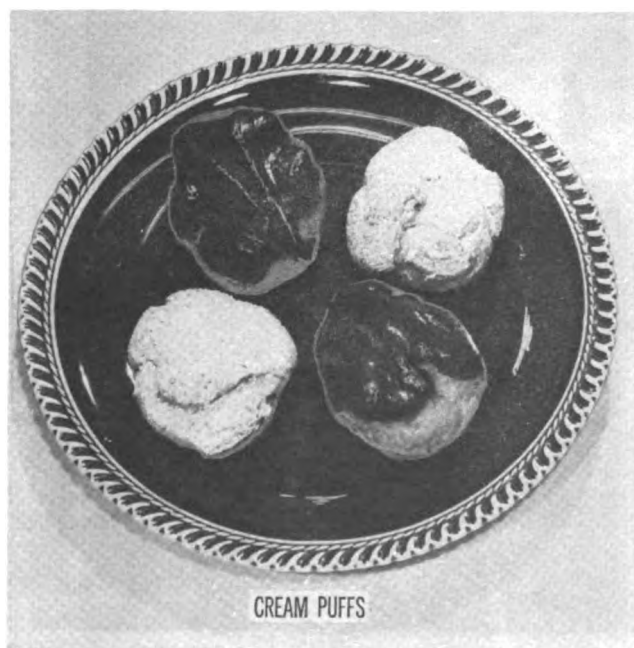


Figure 76. Cream puffs and eclairs.

Step 4. Drop batter on lightly greased pans that have been dusted with flour. Bake at 400° F. for about 30 minutes.

3. Precautions

a. Take care to form the emulsion properly. Overcooked flour, cold eggs, too few eggs, or poor quality eggs will produce a poor emulsion.

b. If the flour is undercooked or if too little water or shortening is used, the shells may be irregularly shaped. Improper makeup can also cause poorly shaped shells.

c. If the shortening is not melted completely in step 1, or if too much shortening or too little water is used, the hollows may fail to develop in the shells.

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NG: State AG (3); units—same as active Army except allowance is one copy.

USAR: Same as active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320-50.

Air Force: S.

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CHANGE }

No. 2 }

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON, D.C., 1 February 1965

PASTRY BAKING

TM 10-411/AFM 146-11, 8 August 1962, is changed as follows:

Change paragraphs 109a(1), 109b(1), 109j(1), 109k(1), 109l(1), 109m(1), 109o(1), 109p(1), 109q(1), 109t(1), 112a(1), 112b(1), and 112c(1) to read as follows:

Bake in 9-inch layer cake pans (1 inch deep), in 9 $\frac{7}{8}$ - by 4 $\frac{1}{4}$ - by 2 $\frac{3}{4}$ -inch loaf cake pans, or in sheet pans. Prepare pans as specified in paragraph 107. Scale 13 ounces of batter for 9-inch layers, 1 pound 6 ounces of batter for loaf cakes, or 6 pounds of batter for sheet cakes.

Note. If using 1 $\frac{1}{2}$ -inch-deep layer cake pans, increase the recipe by one-third, and scale 15 ounces of batter for each 9-inch layer.

4. Establishment

* * * * *

a. Buildings.

- (1) *New buildings.* The Chief of Engineers is responsible for the preparation of standard plans based on sketches originating with the U. S. Army Subsistence Center. These sketches indicate * * * AFM 88-2 and in AFM 88-15.
- (2) *Use of existing facilities.* Existing facilities may * * * directed in AR 30-55. Air Force procedures for modifying an existing facility are contained in AFM 146-1.

* * * * *

5. Types

The type of * * * capacities see AF ECL 856.

Table I. (Superseded) Central Pastry Kitchen
Types and Capacities

Type	Capacity (servings) per 8 hours of operation	
	a	b
BA-7	1,500	3,000
BA-6	3,000	6,000
BA-5	7,000	14,000
BA-3	11,000	22,000

Note. Column a indicates number of men served when 2 pastries per man per day are produced. Column b indicates number of men served when 1 pastry per man per day is produced.

6. Supervision

The installation commander, through the installation quartermaster or **director of supply**, or through the Air Force food service officer, is responsible for supervision of the central pastry kitchen and all operations incident thereto including proper staffing, efficient operation, equitable distribution of baked items to field ration messes, coordination of the installation menu and central pastry kitchen operations, and proper training of unit personnel in pastry baking procedures.

9. Central Pastry Kitchen Personnel

a. *General.* The troop strength * * * each type facility. Staffing guides for Air Force personnel will be found in AFM 26-1 and organization table 4615.

* * * * *

* This change supersedes C 1, 4 January 1963, of TM 10-411/AFM 146-11A, 8 August 1962.

10. Training Program

* * * *

b. (Superseded) The use of a central pastry kitchen as a facility for training personnel must not be overlooked. When ever practicable, students attending local food service schools should be attached to central pastry kitchens for training in mass production of pastry items. Officers having charge of, or taking courses in, mess management or supervision should be attached to the pastry kitchen so that they may become familiar with procedures involved in pastry baking. The installation food adviser, acting for the quartermaster/S-4 or director of supply, will coordinate with the S-1 (G-1) in the selection and rotation of unit mess personnel to receive on-the-job training. On-the-job trainees will be detailed for a minimum of 60 days on an attached basis and will not be considered as a part of, nor cause for reduction in, the number of personnel assigned. The total number of unit mess personnel to receive on-the-job training each period will be in accordance with table II. One-half of the number of trainees will be detailed to the central pastry kitchen every 30 days in order to provide at all times an overlap of personnel with practical knowledge of daily operations. All phases of training within the facility will be under supervision of the assigned skilled personnel and will include actual demonstrations of correct techniques and methods employed. As trainees acquire experience and skill, they should be assigned progressively to more difficult and responsible duties until they become thoroughly acquainted with every phase of pastry baking.

14. Determination of Ingredient Weight

* * * *

b. *Baker's Percent Method (100 Percent Flour).*

* * * *

(1) (Superseded) The standard formula used as an illustration shows the total formula percent as 189.5. Thus the 127.5 pounds of dough required is equivalent to 189.5 percent. To obtain 1 percent of the weight of the formula ingredients, divide 127.5 pounds by 189.5. The result obtained is .6728 pounds. Multiply .6728 pounds by 100

(the percentage of the ingredient flour called for by the formula), and the result 67.28 will be the number of pounds of flour required. To determine the weight of the other ingredients, multiply the weight of the flour (67.28 in this example) by the percent of each ingredient called for by the formula, and divide by 100 to get the decimal in the correct place.

Example: Basic Roll Dough Formula

Ingredient	Percent	Weight in pounds
Flour -----	100	$\times 67.28 \div 100 = 67.28$
Water -----	30	$\times 67.28 \div 100 = 20.18$
Milk, evaporated, whole	30	$\times 67.28 \div 100 = 20.18$
Yeast, compressed ----	3.5	$\times 67.28 \div 100 = 2.35$
Salt -----	2	$\times 67.28 \div 100 = 1.35$
Sugar -----	12	$\times 67.28 \div 100 = 8.07$
Shortening -----	12	$\times 67.28 \div 100 = 8.07$
Total Formula Weight		127.48

20. General

* * * *

b. When a central pastry kitchen is operated by an installation, ingredients necessary for preparation of pastry items listed on the revised installation menu are requisitioned in accordance with AR 31-200 and are delivered directly to the central pastry kitchen. Accounting procedures for * * * ingredients on hand.

21. Requisitioning and Receipt of Ingredients

* * * *

c. The officer in charge of the pastry kitchen, or other person authorized to receipt, will check the ingredients listed on the Request for Issue or Turn-In against the actual ingredients received at time of delivery from the commissary, making any adjustments that may be necessary. Once checked, ingredients * * * the pastry kitchen.

22. Production Record and Summary of Stores

* * * *

c. On completion of * * * continue the inventory. Air Force records will be kept in accordance with AFM 146-1.

23. Delivery and Receipt of Pastry Issues

c. No pastry products * * * the field ration.

Note. This paragraph does not apply to the Air Force. Instruction regarding Air Force procedures on sale of pastry produced in appropriated fund baking facilities will be found in paragraph 7-4, AFM 146-1, 25 November 1963.

24. Monthly Inventory

The quantities of * * * ensuing accounting period. Air Force inventory procedures will be in accordance with AFM 146-1.

34. Characteristics

c. *Water Absorption.* (As changed by C 1, 4 Jan 63) Water absorption, the * * * water to flour. It varies with the type and character of the wheat from which the flour was milled and the conditions under which the flour was stored.

52. Classifications

a. *Animal Fat Shortening.*

(2) *Butter.* Butter, though not * * * from the recipe.

Example: (As changed by C 1, 4 Jan 63) $12.5 \times 16\% = 2$ pounds of water that must be subtracted from the recipe.

70. Function of Pie Dough Ingredients

(Superseded) Pie dough is prepared from four basic ingredients: flour, water, shortening, and salt.

e. *Coloring Agents.* Rescinded.

f. *Wash.* (Superseded) A glazed surface on a pie is not desirable. The practice of washing the surface of a two-crust pie is considered unnecessary except when the top heat in the oven is poor and more crust color is desired, in which case a half-and-half mixture of beaten eggs and water may be used. However, it should be remembered that an egg wash will produce a varnished appearance which will detract from

the eye appeal of the "homemade" look of the product.

71. Function of Pie Filling Ingredients

f. (Superseded) *Starches.* Starches thicken juices to the proper consistency for handling and eating. Three types of starch are used singly or in combination to provide proper body in fruit, cream, and specialty fillings.

(1) *Pure food powdered starch.* This type is a pure refined cornstarch prepared from ordinary field corn. It may be modified to increase its clarity and stability.

(2) *Waxy maize starch.* This type is a refined modified starch prepared from waxy corn. It is an exceptionally clear, gel-producing starch with a short tender body and extreme stability.

(3) *Cold water starch.* The Army has adopted a starch, cold water soluble, edible, as the standard thickening or stabilizing agent for fruit pie fillings. Cold water starch is processed from edible starches. It is pure white, free flowing, odorless, and tasteless. The exceptional thickening power of this product permits the use of a smaller proportion of starch to liquid than is required when cornstarch is used. The use of precooked cold water starch in production of fruit pies has a number of advantages. For example, a batch of filling can be prepared in minutes as opposed to the hours normally required to cook and cool conventional fruit fillings. Since no cooking is required, there is no loss through evaporation, and 6 to 12 percent more filling per batch is produced.

h. *Eggs.* Eggs are used * * * fresh or dry. Frozen eggs are desirable because they are uniform and without shells.

Delete last sentence in paragraph 80.

81. Fruit Pies

(Superseded)

Method 1 is the standard method of preparing fruit pie fillings. Method 2 is included here for

the use of pastry cooks in messes and central pastry kitchens where cold water starch (para. 71f(3)) is not available.

a. Method 1. Fillings Made With Cold Water Starch.

- (1) Drain fruit.
- (2) Add water to juice if necessary to obtain required volume.
- (3) Blend all dry ingredients (starch, sugar, spices, etc.) thoroughly in a separate container.
- (4) Add juice gradually to dry ingredients and mix until smooth.
- (5) Carefully fold drained fruit into thickened mixture.

b. Method 2. Fillings Made With Cornstarch.

- (1) Drain fruit.
- (2) Add water to juice if necessary to obtain required volume.
- (3) Suspend starch in portion of liquid.
- (4) Bring main portion of juice to a boil, stir in suspended starch, gelatinize starch, and cook until thick and clear. Remove from heat.
- (5) Add sugar and stir only enough to dissolve the sugar.
- (6) Pour cooked mixture over drained fruit and blend carefully. Chill filling before putting it in the pie shell.

84. Cream Pies

a. General. (Superseded) Current medical regulations prescribe that "foods which really support bacterial growth, such as locally prepared cream fillings, cream sauces, custards, etc., will in no instance be prepared more than 3 hours before serving and always as near to serving time as possible." In compliance with these regulations, the central pastry kitchen will bake and deliver pie shells for cream pies and layer cakes for cream-filled type cakes; and the messes will prepare the cream fillings and complete the production of these types of pastry products as near to serving time as possible. The cooked fillings may be poured directly into the prebaked shells (fig. 9).

* * * * *

Change title of Section V, Chapter 5, to **Topping.**

Delete first sentence in paragraph 85.
Paragraph 86 is rescinded.

89. Pie Dough

(As changed by C 1, 4 Jan 63) The total quantity of salt in the recipe should read **0 pounds 6 1/4 ounces.**

90. Fruit Fillings

In the recipe for peach filling, from canned peaches (subpara. i), "**WaterWater**" should read **Water or juice.**

91. Cream Fillings

In the recipe for lemon filling (subpara. f), the total quantity of egg yolk should read **3 pounds 0 ounces.**

96. Meringue Faults

Meringue will break * * * from whipping properly. Too much moisture in the eggs may also prevent them from whipping properly; a small amount of cornstarch added to the egg whites will absorb excess moisture.

98. Function of Cake Ingredients

* * * * *
c. Sirup. To improve keeping * * * of sirup needed. The sirups normally issued for baking will have an **approximate** solid content of 80 percent. The number of * * * pounds of liquid.

105. General

The care and * * * possible finished products. Figures 12 through 18 illustrate various steps in producing quality plain cake, Boston cream pie, upside-down cake, and **jelly roll**, and show some finished products.

107. Baking

(Superseded)

The way in which a cake is to be finished and served (figs. 13-18) determines how the cake pan will be prepared. If a cake is to be served direct from the pan, the pan should be greased and dusted with flour, or greased with a specially prepared pan grease. If the cake is to be removed from the pan, the pan should be greased and lined with a pan liner or greased paper to facilitate removal of the baked cake. Pan grease is made by creaming together two parts shortening and one part flour. In cold weather a little salad oil should be added to the

flour-shortening mixture to facilitate spreading. Cakes produced from a rich formula require a cooler oven than those baked from a lean formula. Use baking temperatures cited in the recipes.

Change caption of figure 16 to read as follows:

- 1 Upside-down cake 2 Iced sheet cake

Figure 16. Finished *sheet* cakes.

109. Batter-Type Cakes

In recipe for spice cake (subpara. o), delete last five lines of step 2 of procedure.

* * * * *

s. *Upside-Down Cake.*

* * * * *

(2) *Pan spread.*

* * * * *

(c) Spread fruit ((g) below) over pan spread.

* * * * *

112. High Ratio Cakes

d. (Added) *White Cake (120% Sugar).*
Yield: 100 Servings.

Ingredients	Pounds	Ounces	Procedure
Flour, soft.....	3	0	Step 1. Sift all dry ingredients together twice. Place all ingredients for this step into the mixing bowl. Mix for 3 minutes at medium speed. Scrape bowl down thoroughly.
Sugar, granulated..	3	9½	
Salt.....	0	1½	
Baking powder....	0	3	
Shortening, emulsified.	1	10	
Milk, evaporated, whole.	1	7	Step 2. Combine egg whites and vanilla. Add to above slowly while mixing at slow speed. Scrape bowl down thoroughly. Mix for 3 minutes at medium speed.
Water.....	1	3	
Egg whites.....	2	5	
Vanilla.....	0	1¼	

- (1) Bake in 9-inch layer cake pans (1 inch deep), in 9⅞- by 4¼- by 2¾-inch loaf cake pans, or in sheet pans. Prepare pans as specified in paragraph 107. Scale 13 ounces of batter for 9-inch layers, 1 pound 6 ounces of batter for loaf cakes, or 6 pounds of batter for sheet cakes.

Note. If using 1½-inch-deep layer cake pans, increase the recipe by one-third, and scale 15 ounces of batter for each 9-inch layer.

- (2) Bake in moderate oven (360° to 380° F.). Bake layer cakes 18 to 22 minutes; loaf cakes 45 to 60 minutes; and sheet cakes 20 to 30 minutes.
- (3) Turn layer or sheet cakes from pans onto sugared paper while cakes are still warm. Turn loaf cakes onto wire rack.

121. Pound Cakes

w. *Eggs Do Not Beat Properly.* See paragraph 120v.

148. Quick Coffeecake

a. *Batter Recipe.* Yield: 100 servings.

151. General

Table III. (Superseded) *Typical Schedule for Preparing Yeast-Raised Goods for a Specific Serving Time*

Desired serving time: 1145

Procedures for production	Starting time	Procedure time
Start mixing dough	0900	10 min.
Time for dough to come from mixer.	0910	
Fermentation time	1040	90 min.
Time to take dough for makeup		30 min.
Makeup time		
Time in proofing cabinet	1110	20 min.
Time in oven	1130	15 min.
Ready for serving	1145	

153. Preliminary Preparation

b. *Yeast (Active Dry).* (As changed by C 1, 4 Jan 63) Because active dry *** as compressed yeast. Reconstitute active dry yeast in a water solution of 105° to 110° F. Allow the suspension *** to the mix.

156. Makeup

a. *Hard Rolls.*

- (1) *Machine.*

(a) (Superseded) *Roll divider.* The roll

divider divides the dough into 36 pieces which must be rounded by hand.

- (b) (Superseded) *Roll divider and rounder*. The roll divider and rounder (6, fig. 26) divides the dough into 36 pieces and rounds the pieces automatically.

161. Hard Rolls

(Added) Yield: 100 3-ounce rolls.

162. Basic Sweet Dough

(Added) Yield: Approximately 200 2-ounce rolls.

Change identification of items in figure 51 as follows:

- 2 Double snail
- 6 S
- 7 (Added) Snail

185. Makeup

a. *Cream Horn*. Figure 53 shows a cream filling. To finish, dust the cream horns (1, fig. 55) with powdered sugar.

b. *Patty Shells*. Figure 54 shows or cream fillings. Fill the centers when the shells (2, fig. 55) have cooled.

c. *Filled Turnovers*. Roll the dough out to a thickness of $\frac{1}{16}$ inch and cut it into $4\frac{1}{2}$ -inch squares. Place fruit or Bake and serve.

Change step 3 of figure 54 to read as follows:

3 Dock rolled scrap dough for shell bottoms

In Glossary of Baking Terms and Phrases, page 193, change definition of *French Knife* to read as follows:

French Knife—Long knife with tapered blade used to dice fruit and nuts.

APPENDIX I (Superseded)

REFERENCES

1. Army References

AR 15-230	Installation Menu Board.
AR 15-231	Master Menu Board.
AR 30-11	Army Food Program.
AR 30-15	Table of Food Equivalents.
AR 30-40	Rations.
AR 30-41	Field Rations.
AR 30-55	Central Pastry Kitchens.
AR 30-60	Garrison Bread Bakeries.
AR 30-741	Classification and Care of Subsistence Stores.
AR 31-192	Food Facilities Summary.
AR 31-200	Commissaries, Army Commissary Operating Procedures.
AR 40-5	Preventive Medicine.
AR 40-657	Veterinary Food Inspection.
AR 210-17	Inactivation of Command Installations.
AR 320-5	Dictionary of United States Army Terms.
AR 320-50	Authorized Abbreviations and Brevity Codes.
AR 320-60	Office Symbols.
AR 350-5	Military Education and Service Schools.
AR 385-10	Army Safety Program.
AR 385-40	Accident Reporting and Records.
AR 420-22	Preventive Maintenance.
AR 420-47	Refuse Collection and Disposal.
AR 420-55	Food Service and Related Equipment.
AR 420-76	Entomology Services.
AR 420-90	Fire Prevention and Protection.
TA 20-4	Equipment for Food Service Facilities Serving Field Installations, Troop and Hospital Trains, and Army Vessels.
TA 50-986	Allowances of Expendable Supplies to Supplement Equipment of Food Service Facilities Serving Field Installations, Troop and Hospital Trains, and Army Vessels.
TM 5-637	Inspection and Preventive Maintenance Services for Kitchen Equipment.
TM 5-640	Ranges, Bake Ovens, and Burners for Mess Equipment; Repairs and Utilities.
TM 8-501	Nutrition.
TM 8-525	Sanitary Food Service.
TM 10-210	Inspection and Storage of Subsistence Supplies.
TM 10-401	The Army Food Adviser.
TM 10-404	Ration Breakdown Point Operations.
TM 10-405	Army Mess Operations.
TM 10-410	Bread Baking.
TM 10-412	Recipes.

TM 10-415	Operation of Garrison Mess Equipment.
TM 10-701	Range Outfit, Field, Gasoline, M-1937, With Accessory Outfit.
TM 10-706	Field Bakery, Portable, M-1942.
TM 10-7360-201-10	Operator's Manual: Bakery Plant, Mobile, M-1945 (FSN 7360-221-2418).
TM 10-7360-201-20	Organizational Maintenance Manual: Bakery Plant, Mobile, M-1945 (FSN 7360-221-2418).
TM 10-7360-201-35	Field and Depot Maintenance Manual: Bakery Plant, Mobile, M-1945 (FSN 7360-221-2418).
FM 21-5	Military Training.
FM 21-6	Techniques of Military Instruction.
FM 21-10	Military Sanitation.
FM 21-30	Military Symbols.
SB 10-260	Master Menu (Current).
SB 10-260-1	Recapitulation of Master Menu Issues.
TF 8-1665	Personal Hygiene.
TF 8-1672	Sanitation Techniques in Rat Control.
TF 8-1673	Practical Rat Control—Ratproofing.
TF 8-2295	Mess Sanitation.
DA Pam 20-551	Staffing Guide for U.S. Army Garrisons.
DA Pam 108-1	Index of Army Motion Pictures, Filmstrips, Slides, Tapes, and Phono- Recordings.
DA Pam 310-series	Military Publications Indexes (as applicable).
JCS Pub 1	Dictionary of United States Military Terms for Joint Usage.

2. Air Force Publications

AFR 0-2	Numerical Index of Standard Air Force Publications.
AFR 0-9	Numerical and Functional Indexes of Departmental Forms.
AFR 145-1	Air Force Subsistence Program.
AFR 145-7	Monetary Value of Field Ration "A".
AFR 145-21	Rations.
AFR 160-48	Veterinary Food Inspection.
AFR 160-95	Nutrition.
AFR 163-1	Veterinary Service, United States Air Force.
AFM 26-1	Policies, Procedures and Criteria (Manpower).
AFM 145-1	Commissary and Subsistence Depot Operating Manual.
AFM 146-1	Food Service Management.
AFM 146-5	Bread Baking.
AFM 146-7	Instructor's Guide—Sanitary Techniques and Personal Hygiene.
AFM 146-8	Operation and First Echelon Maintenance of Food Service Equipment.
AFM 146-12	Recipes.
AFM 160-36	Medical Aspects of Food Service (Food Poisoning and Food Inspection).
AFP 146-1-series	Master Menu.
AFP 146-2-series	Recap of Master Menu Issues.

APPENDIX II

MACHINERY AND EQUIPMENT

Change identification of item in figure 58 as follows:

- 16 Docker (improvised)
- 17 Long-handled spoon

9. Revolving Table (Superseded)

a. This piece of equipment (fig. 62.1) is a hand-operated 7-foot-diameter round revolving table designed for use in making pies. It streamlines the production flow of 9-inch pies, and functions in conjunction with pie dough rolling machine (bottoms), filling operations, pie dough rolling machine (tops), and pie rimmer trimmer.

b. The proper use of the revolving table

enables operations to be accomplished in a continuous flow of production, carrying pie bottoms in plates, filling pie shells, washing bottom crusts, placing top crusts on pies, and carrying pies to trimming machine.

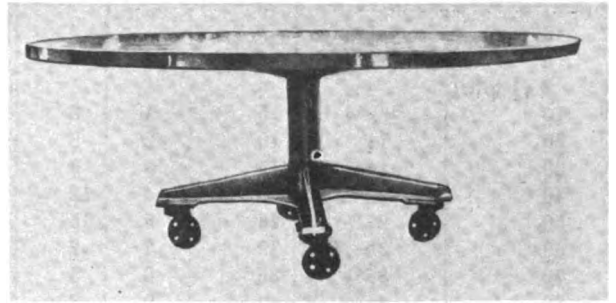


Figure 62.1. (Added) Revolving table.

APPENDIX VIII (Superseded)

CONVERSION OF OTHER FORMS OF WHOLE MILK TO APPROPRIATE EQUIVALENTS IN LIQUID WHOLE MILK

Liquid whole milk (pound)	Evaporated milk		Dry whole milk				Dry skim milk					
	Milk (14½ oz. can)	Water (pound)	Milk (whole dry)		Water		Milk (dry skim)		Butter or shortening		Water	
			Pound	Ounce	Pound	Ounce	Pound	Ounce	Pound	Ounce	Pound	Ounce
2 (qt.)	1½	1	--	4	1	12	--	2½	--	1½	1	12
5	2½	2½	--	9½	4	6½	--	7	--	3½	4	6
8 (1 gal.)	4½	4	1	--	7	6½	--	11	--	5	7	
10	5½	5	1	3	8	13	--	14	--	½	8	12
20	11	10	2	6	17	10	1	12	--	13	17	8
30	16½	15	3	9	26	7	2	10	1	3½	26	4
40	22	20	4	12	35	4	3	8	1	10	35	
50	27½	25	5	15	44	1	4	6	1	13½	43	12
60	33	30	7	2	52	14	5	4	2	½	52	8
70	38½	35	8	5	61	11	6	2	2	7	61	4
80	44	40	9	8	70	8	7	0	2	13½	70	0
90	49½	45	10	11	79	5	7	14	3	4	78	12
100	55	50	11	14	88	2	8	12	3	10½	87	8

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For explanation of abbreviations used, see AR 320-50.

Air Force: B; X (Food Service Squadrons 2).

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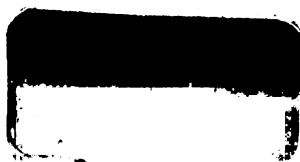
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